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Alison Hubbard Ashton
TICOM and the Analysis of Internal Controls
Andrew D. Bailey, Jr., Gordon Leon Duke, James Gerlach, Chen-en Ko, Rayman D. Meservy, and Andrew B. Whinston
Audit Conflict: An Empirical Study of the Perceived Ability of Auditors to Resist Management Pressure
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APRIL 1985

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THE ACCOUNTING REVIEW
Vol. LX, No. 2
April 1985

Does Consensus Imply Accuracy in Accounting Studies of Decision Making?

Alison Hubbard Ashton

ABSTRACT: The empirical relationship between consensus and accuracy is examined in two prediction tasks of interest to accountants—a managerial accounting task and an auditing task. The relationship between these two attributes is particularly important in auditing contexts in which consensus is sometimes accepted as a practical goal. The results of this study indicate a consistent, highly positive relationship between consensus and accuracy. The mean Pearson (Spearman) correlation between the two attributes was .84 (.82) across (1) the two tasks, which featured both continuous and dichotomous outcomes and which were performed by different sets of experts, (2) both individual and pairwise measures of subjects' consensus and accuracy, and (3) both correlational and absolute measures of performance in the managerial accounting task.

An important goal of research in individual decision making is improved decisions. Improvement implies some standard to which actual decisions can be compared. In most research, this standard has been "correctness" or accuracy. However, a problem in most accounting research contexts is the absence of an objective external criterion. The criterion problem exists, for example, in performance evaluation tasks, but is particularly acute for various types of audit judgments, such as internal control evaluation and probability assessment.

The response to the criterion problem in a large body of accounting research has been to study *consensus,* or agreement among decision makers, rather than accuracy. Einhorn [1974] describes consensus as a necessary, but not sufficient, condition for accuracy among a group of expert decision makers. While lack of consensus among a group of experts implies that at least some of the experts are not accurate, strong consensus does not necessarily imply accuracy. Einhorn argues, however, that actions and decisions may have to be based on the imperfect consensus criterion when use of the preferable accuracy criterion is not feasible.

In accounting and auditing decision contexts for which accuracy cannot be used, it would be useful to know the empirical relationship between consensus and accuracy. One could then assess the extent to which the two attributes are related in those contexts, and consensus could be evaluated as a surrogate for accuracy.

One way to proceed toward this end is

I am grateful to Thomas Kida for providing the data on which part of this paper is based and to Vijay Karan and Greg Tully for helpful comments on an earlier draft.

Alison Hubbard Ashton is Visiting Associate Professor of Accounting, University of Alberta, on leave from New York University.

Manuscript received October 1983.
Revision received April 1984.
Accepted June 1984.

first to examine consensus and accuracy in decision settings for which external criteria are available. The relationship found in such settings may be reasoned to exist in settings for which criteria are not available.[1] Of course, the strength of the relationship between consensus and accuracy might vary depending upon characteristics of the decision context and environment. Thus, the identification of any such contingencies would be an important part of this research strategy.

The purpose of this paper is to suggest a method for comparing consensus and accuracy in empirical settings, and to provide initial evidence about the empirical correspondence between the two attributes in two prediction tasks. I am aware of no prior empirical research that addresses this issue.[2]

THE PREDICTION TASKS

Only a few accounting studies have been conducted in contexts for which an external criterion is available. The data from two of these studies have been selected for analysis in this paper. This section describes the essential features of these two prediction tasks. Detailed research reports are available in the literature.

The first task involves *sales predictions.* Ashton [1982] investigated the accuracy of individuals' predictions in a budgeting task. Thirteen Time, Inc. executives made 42 predictions of the number of advertising pages appearing annually in *Time* magazine over a 14-year period. The subjects, who were executives at Time, Inc. magazines other than *Time,* normally make this type of sales prediction quarterly. The predictions were based on five cues that are actually provided to Time, Inc. executives for such predictions: (1) the quarter to which the data applied; (2) the total number of advertising pages appearing in *Time* magazine that quarter; (3) the number of pages of liquor advertising appearing in *Time* magazine during the quarter; (4) the number of pages of automobile advertising appearing in *Time* magazine during the quarter; and (5) the number of advertising pages committed by *Time* advertisers to date for the entire year. The cue values given were the actual observations available at the end of the first, second, and third quarters for each of the 14 years, and the executives made three predictions of actual annual advertising page sales for each of the 14 years based on the quarterly data.

Prediction accuracy was evaluated against the criterion of actual advertising page sales for the respective years. Accuracy was measured in two ways: (1) as the correlation between the actual advertising pages sold and the subject's predictions, and (2) as mean absolute error in pages.

The second task involves *going-concern predictions.* Kida [1980] focused on the ability of auditors to predict firms' going-concern problems. Twenty-seven audit partners predicted whether each of 40 firms would experience going-concern problems within one year of a given financial statement date. Half of the firms in the sample actually had experienced one of six events (e.g., entering receivership or liquidating assets) deemed indicative of going-concern problems.

---

[1] Such a research strategy has been used, for example, in decision research on the "Man vs. Model" issue. Results found in decision contexts for which external criteria are available (the predictive superiority of statistical models over humans) were extrapolated to contexts in which external criteria are not available [Goldberg, 1970].

[2] It may be useful to distinguish between the notion of consensus (the extent to which individuals agree) and that of a "composite" judgment. The latter is formed by mathematically aggregating individual judgments; composites can increase accuracy by reducing the inconsistency inherent in human judgment [Einhorn, Hogarth and Klempner, 1977]. Thus, the formation of a composite is a mechanical technique which may be imposed independently of the level of agreement among the individuals. Composites are not discussed in this paper.

The cues were five financial ratios: (1) net income/total assets; (2) net worth/total debt; (3) quick assets/current liabilities; (4) sales/total assets; and (5) cash/total assets. The auditors indicated their predictions about continuity on a six-point scale labeled "I believe this firm does/does not have going-concern problems," which was used to obtain a dichotomous prediction classification.

Three features of these two prediction settings provide alternative perspectives from which to view the present analysis. First, the predictions are set in two different contexts of interest to accounting researchers—managerial accounting/budgeting and audit decision making. Second, the sales predictions involve continuous outcomes, while the going-concern predictions involve dichotomous outcomes. Third, performance in the sales prediction task can be measured both in correlational terms and in absolute terms (number of pages). Thus, the prediction tasks chosen for analysis include some potentially relevant variables for understanding any differential relationships between consensus and accuracy that might result from various task settings and analyses.

It is important to recognize that the traditional measures of consensus and accuracy are not comparable. Consensus traditionally is expressed as agreement between *pairs* of subjects, while accuracy typically is measured for an *individual* subject. Consequently, to facilitate comparisons between these two dimensions of judgment performance, new measures of accuracy and consensus were developed. First, pairwise accuracy was developed as a counterpart to the traditional measure of pairwise consensus. Second, individual consensus was developed as a counterpart to the traditional measure of individual accuracy.

Moreover, since one of the prediction settings used in this study involves both correlational and absolute accuracy measures, as described above, it is possible to express the pairwise and individual performance measures in both correlational and absolute terms. Therefore, in the analysis to follow, four separate types of comparisons are made: (1) Pairwise correlational consensus is compared to pairwise correlational accuracy; (2) Individual correlational consensus is compared to individual correlational accuracy; (3) Pairwise absolute consensus is compared to pairwise absolute accuracy; (4) Individual absolute consensus is compared to individual absolute accuracy. These measures and their use in the data analysis are described more fully in the following sections.

ANALYSIS AND RESULTS: SALES PREDICTIONS

Pairwise Analysis

The pairwise analysis is based on the consensus measure traditionally discussed in the literature, i.e., the correlation between the predictions of each *pair* of subjects. This measure is called "pairwise correlational consensus" in this paper. The accuracy measure traditionally discussed in the literature is the correlation between the subject's predictions and the actual outcomes. To compare pairwise correlational consensus with accuracy, an analogous measure of accuracy was developed by computing the mean accuracy for each pair of subjects. This measure is called "pairwise correlational accuracy" in this paper. In addition, measures of pairwise *absolute*

TABLE 1

SALES PREDICTIONS: PAIRWISE AND INDIVIDUAL CORRELATIONAL CONSENSUS

Subject	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
1	—												
2	.558	—											
3	.813	.461	—										
4	.748	.433	.631	—									
5	.669	.215	.851	.492	—								
6	.761	.339	.729	.578	.706	—							
7	.927	.645	.792	.757	.702	.796	—						
8	.604	.389	.599	.438	.482	.648	.610	—					
9	.693	.632	.531	.670	.165	.479	.663	.435	—				
10	.629	.537	.488	.455	.184	.419	.552	.291	.656	—			
11	.915	.569	.772	.763	.641	.741	.954	.550	.736	.540	—		
12	.606	.292	.481	.588	.671	.594	.742	.477	.200	.009	.685	—	
13	.841	.481	.942	.649	.840	.792	.843	.644	.569	.474	.835	.556	—
Mean*	.760	.472	.715	.614	.596	.653	.782	.522	.556	.451	.763	.516	.746

* Individual Correlational Consensus. Fisher's z-transformation [Glass and Stanley, 1970] was used in calculating mean correlations.

accuracy and pairwise absolute consensus were developed. Thus, the relationship between pairwise accuracy and pairwise consensus is examined in both correlational and absolute terms.

Pairwise Correlational Analysis. In the sales prediction task, *pairwise correlational consensus* is the correlation between the 42 predictions made by each pair of the 13 subjects. For example, the correlation between the prediction vector for subject one and the prediction vector for subject two is .558, as shown in Table 1. There are 78 such pairwise correlations. *Pairwise correlational accuracy* is defined as the mean accuracy score for each of the 78 subject pairs. That is, the correlation between the criterion vector and the prediction vector for subject i was computed, yielding individual correlational accuracy which is the traditional accuracy measure. The same was done for subject j. Then these two individual correlational accuracy measures were averaged, using Fisher's z-transformation [Glass and Stanley, 1970]. The result is pairwise correlational accuracy for subjects i and j. These numbers are shown in Table 2. For example, the pairwise correlational accuracy for subject one and two is the mean (.791) of their individual correlational accuracy scores (.879 and .650, respectively).

The numbers in Tables 1 and 2 are generally high, but some variability is evident. For example, pairwise consensus (Table 1) ranges from .954 to .009. Pairwise accuracy (Table 2) ranges from .907 to .613. The question, however, is whether consensus and accuracy co-vary across the 78 pairs. One way to determine this is to compute the correlation between the accuracy and consensus scores for the 78 pairs. If a positive relationship exists between consensus and accuracy, we should expect a positive correlation. The Pearson (Spearman) correlation between pairwise correlational consensus in Table 1 and pairwise correlational accuracy in Table 2 is .765 (.767), indicating a strong positive relationship between the two attributes.[3]

---

[3] Note that the use of correlations for *comparing* consensus and accuracy is not subject to the same criticism that may be appropriate for correlational *measures*

TABLE 2

SALES PREDICTIONS: PAIRWISE* AND INDIVIDUAL CORRELATIONAL ACCURACY

Subject	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
1	—												
2	.791	—											
3	.854	.750	—										
4	.824	.702	.788	—									
5	.800	.664	.760	.714	—								
6	.804	.671	.766	.720	.685	—							
7	.899	.824	.878	.852	.832	.836	—						
8	.781	.634	.738	.688	.649	.657	.815	—					
9	.804	.670	.765	.719	.684	.690	.835	.656	—				
10	.777	.629	.734	.683	.644	.651	.812	.613	.650	—			
11	.889	.807	.866	.838	.816	.820	.907	.798	.819	.794	—		
12	.780	.632	.736	.686	.647	.654	.814	.616	.653	.611	.796	—	
13	.869	.773	.841	.809	.783	.788	.890	.763	.788	.759	.879	.761	—
Individual Correlational Accuracy	.879	.650	.824	.746	.678	.691	.916	.619	.689	.607	.898	.614	.857

* Fisher's z-transformation [Glass and Stanley, 1970] was used in calculating mean correlations.

Pairwise Absolute Analysis. While correlational measures of consensus and accuracy typically are employed in judgment research, they can be misleading if used and interpreted inappropriately. In the present context it is possible, for example, that high correlational accuracy could be found for a subject whose page predictions are poor when measured in absolute terms. This type of problem could also occur for pairwise correlational consensus. Therefore, measures of absolute accuracy and absolute consensus were also employed.

In this context, *pairwise absolute consensus* is defined as the mean difference, over the 42 observations, in the sales predictions (in pages) of each pair of subjects. These numbers are shown for each of the 78 subject pairs in Table 3. For example, the mean absolute difference for subjects one and two is 481 pages. *Pairwise absolute accuracy* is defined as the mean of the individual accuracy scores for each subject pair. That is, the mean absolute error over the 42 predictions was computed for subject *i*, yielding individual absolute accuracy. The same was done for subject *j*. Then, the mean of these two individual absolute accuracy measures was computed. The result is pairwise absolute accuracy for subjects *i* and *j*. For example, the pairwise accuracy score for subjects one and two (356) is the mean of their individual accuracy scores (151 and 561), as shown in Table 4. (In Tables 3 and 4 note that smaller numbers indicate greater consensus and greater accuracy.)

Pairwise absolute consensus ranges from 44 pages to 642 pages. Pairwise absolute accuracy ranges from 132 pages to 492 pages. The relationship between consensus and accuracy measured in absolute terms was determined in the same way as that between consensus and accuracy measured in correlational terms.

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of consensus and accuracy. To the extent that consensus and accuracy are absolute concepts, then correlational measures may be misleading. However, if the focus is not on levels of consensus and accuracy but upon the extent to which the two attributes move together, then correlational comparisons are appropriate.

TABLE 3

SALES PREDICTIONS: PAIRWISE AND INDIVIDUAL ABSOLUTE CONSENSUS

Subject	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
1	—												
2	481	—											
3	221	532	—										
4	182	463	279	—									
5	372	372	294	404	—								
6	213	439	242	263	330	—							
7	184	625	303	250	406	357	—						
8	264	411	300	279	381	242	360	—					
9	363	277	468	362	642	382	476	382	—				
10	310	469	412	360	582	384	360	422	348	—			
11	210	591	301	271	398	333	159	379	447	336	—		
12	391	603	460	407	505	413	401	437	566	597	383	—	
13	197	489	44	252	284	199	286	261	431	390	278	426	—
Mean*	282	479	321	314	414	316	347	343	429	414	341	466	295

* Individual Absolute Consensus

That is, Pearson and Spearman correlations were computed between pairwise absolute consensus in Table 3 and pairwise absolute accuracy in Table 4. The Pearson (Spearman) correlation is .688 (.747). Thus, a strong positive relationship between accuracy and consensus is found regardless of whether consensus and accuracy are measured in correlational or absolute terms.

Individual Analysis

The pairwise analysis indicates how consensus between a pair of subjects relates to the mean accuracy of the pair, and was motivated by the traditional measure of consensus found in the literature. The *individual* analysis, on the other hand, focuses on the relationship between the accuracy of an individual subject's predictions and the overall consensus of the subject's predictions with the predictions of other subjects. Thus, the analysis shifts in perspective from pairs of subjects to an individual subject. As the pairwise analysis was based on the traditional measure of consensus, the individual analysis derives from the traditional measure of accuracy.

Individual Correlational Analysis. In the present context, *individual correlational accuracy* is simply the correlation between a subject's predictions and the actual outcomes over the 42 cases, and is given at the bottom of Table 2. For example, the correlation between the prediction vector for subject one and the criterion vector (i.e., actual annual sales) is .879. *Individual correlational consensus* is, for each subject, the mean pairwise consensus with the other 12 subjects, and is given at the bottom of Table 1. For example, for subject one, .760 is the mean of the pairwise correlational consensus scores for the 12 pairs in which subject one is included. Again, Fisher's z-transformation [Glass and Stanley, 1970] was used in calculating mean correlations. As in the pairwise analysis, the accuracy and consensus scores are generally high. However, correlational accuracy varies from .916 to .607, and correlational consensus from .782 to .451. The relationship between accuracy and consensus is very strong, as indicated by the correlation between individual consensus (bottom of Table 1) and individual accuracy (bottom of

TABLE 4

SALES PREDICTIONS: PAIRWISE AND INDIVIDUAL ABSOLUTE ACCURACY

Subject	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
1	—												
2	356	—											
3	196	401	—										
4	185	390	230	—									
5	264	469	309	298	—								
6	221	426	266	255	334	—							
7	132	337	177	166	245	202	—						
8	230	435	275	264	342	300	211	—					
9	287	492	332	321	400	357	268	366	—				
10	240	445	285	274	353	310	221	319	376	—			
11	166	371	211	200	279	236	147	245	302	255	—		
12	285	490	330	319	397	355	266	363	421	374	300	—	
13	187	392	232	221	300	257	168	266	323	276	202	321	—
Individual Absolute Accuracy	151	561	241	219	376	291	113	308	423	329	181	418	223

Table 2). The Pearson (Spearman) correlation is .956 (.973).

Individual Absolute Analysis. In the present context, *individual absolute accuracy* is, for each subject, the mean error in page predictions over the 42 observations and is given at the bottom of Table 4. For example, 151 is the mean difference between the prediction vector for subject one and the criterion vector of actual annual sales. *Individual absolute consensus* is the mean, over the 12 subject pairs in which an individual is included, of the mean difference in the 42 predictions of each pair. For example, 282 is the mean of the pairwise absolute consensus scores for the 12 pairs in which subject one is included, as shown in Table 3. Individual absolute consensus ranges from 282 to 479. Individual absolute accuracy ranges from 113 to 561. Again, the relationship between accuracy and consensus is high, as indicated by the Pearson (Spearman) correlation between individual consensus (bottom of Table 3) and individual accuracy (bottom of Table 4) of .859 (.769).

Further Individual Analysis. Table 5 provides additional information on the relationship between consensus and accuracy, based on the individual analysis. Subjects were ranked and classified as being above or below the median on each of the two attributes of consensus and accuracy. For the correlational analysis, every subject who was at or above median accuracy was also at or above median consensus. For the absolute analysis, the results were similar except that subject seven was above median accuracy but below median consensus. (When examining Table 5, recall that smaller numbers indicate greater accuracy and consensus in the absolute analysis.) These results provide further support for the strong positive association between consensus and accuracy that was indicated by the Pearson and Spearman correlations.

ANALYSIS AND RESULTS: GOING-CONCERN PREDICTIONS

Since the going-concern predictions from Kida's [1980] data are treated as dichotomous variables (i.e., the firm either will or will not experience going-

TABLE 5

SALES PREDICTIONS: FURTHER INDIVIDUAL ANALYSIS—RANKING OF SUBJECTS ON CORRELATIONAL AND ABSOLUTE CONSENSUS AND ACCURACY

	Ranking by Subject Number		
Individual Consensus	*Consensus*	*Accuracy*	*Individual Accuracy*
	(CORRELATIONAL ANALYSIS)		
.782	7	7	.916
.763	11	11	.898
.760	1	1	.879
.746	13	13	.857
.715	3	3	.824
.653	6	4	.746
.614	4*	6*	.691
.596	5	9	.689
.556	9	5	.678
.522	8	2	.650
.516	12	8	.619
.472	2	12	.614
.451	10	10	.607
	(ABSOLUTE ANALYSIS)		
479	2	2	561
466	12	9	423
429	9	12	418
414	10	5	376
414	5	10	329
347	7	8	308
343	8*	6*	291
341	11	3	241
321	3	13	223
316	6	4	219
314	4	11	181
295	13	1	151
282	1	7	113

* Individual subject(s) with median scores on consensus and accuracy.

concern problems), correlational measures of consensus and accuracy were not developed for this task. Instead, the pairwise and individual analyses are presented only in absolute terms.

Pairwise Analysis

In this context, *pairwise absolute consensus* is the number of cases (out of 40) about which a pair of subjects agree in their predictions of whether the firm will or will not experience going-concern problems. These numbers are shown for the 300 subject pairs in Table 6.[4] Subjects one and two, for example, agreed in their predictions in 34 of the 40 cases. *Pairwise absolute accuracy* is the mean, for a pair of subjects, of their accuracy scores (i.e., number of correct predictions) over the 40 cases. These numbers are shown in Table 7. For example, the pairwise absolute accuracy score for subjects one and two (36) is the mean of

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[4] This analysis included only 25 of Kida's 27 subjects. The two omitted subjects did not respond to some of the cases.

TABLE 6

GOING-CONCERN PREDICTIONS: PAIRWISE AND INDIVIDUAL ABSOLUTE CONSENSUS

Subject	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*
1	—																								
2	34	—																							
3	35	31	—																						
4	29	23	32	—																					
5	30	34	29	23	—																				
6	36	34	33	27	32	—																			
7	35	31	36	32	29	35	—																		
8	31	31	28	22	35	29	28	—																	
9	30	34	29	21	32	32	29	33	—																
10	33	35	34	26	35	33	34	32	33	—															
11	31	31	28	20	31	29	28	34	29	32	—														
12	38	36	33	27	32	36	35	33	32	35	33	—													
13	33	33	28	22	33	33	30	34	31	32	34	35	—												
14	32	36	31	23	30	34	31	31	38	33	29	34	31	—											
15	27	31	24	16	31	29	24	34	35	28	34	29	32	33	—										
16	33	37	30	22	33	33	30	34	35	34	34	35	36	35	34	—									
17	31	29	34	30	29	31	34	30	31	34	28	31	28	31	26	30	—								
18	29	33	26	18	33	29	26	34	33	30	34	31	34	31	36	36	26	—							
19	37	33	36	30	31	37	38	30	31	36	30	37	32	33	26	32	34	28	—						
20	34	36	31	25	34	34	31	31	30	33	29	34	31	32	27	33	29	31	33	—					
21	34	34	31	23	32	34	31	35	36	35	33	36	33	36	33	35	33	31	33	32	—				
22	33	31	32	24	33	33	30	32	31	34	32	33	32	31	30	32	30	30	32	29	35	—			
23	36	34	33	29	34	38	35	31	30	33	29	36	33	32	27	33	31	29	37	36	32	31	—		
24	33	35	30	22	31	33	30	34	37	34	32	35	32	37	34	36	32	32	32	31	39	34	31	—	
25	36	30	37	33	28	34	37	27	28	33	27	34	29	30	23	29	33	25	37	30	30	31	34	29	—
Mean*	32.92	32.75	31.29	24.96	31.42	32.83	31.63	31.38	31.67	32.96	30.46	33.75	31.71	32.25	29.29	32.96	30.63	30.21	33.13	31.50	33.17	31.46	32.67	32.71	31.00

* Individual Absolute Consensus

TABLE 7
GOING-CONCERN PREDICTIONS: PAIRWISE AND INDIVIDUAL ABSOLUTE ACCURACY

Subject	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*
1	—																								
2	36.0	—																							
3	33.5	34.5	—																						
4	29.5	30.5	28.0	—																					
5	34.0	35.0	32.5	28.5	—																				
6	36.0	37.0	34.5	30.5	35.0	—																			
7	33.5	34.5	32.0	28.0	32.5	34.5	—																		
8	33.5	34.5	32.0	28.0	32.5	34.5	32.0	—																	
9	35.0	36.0	33.5	29.5	34.0	36.0	33.5	33.5	—																
10	34.5	35.5	33.0	29.0	33.5	35.5	33.0	33.0	34.5	—															
11	33.5	34.5	32.0	28.0	32.5	34.5	32.0	32.0	33.5	33.0	—														
12	36.0	37.0	34.5	30.5	35.0	37.0	34.5	34.5	36.0	35.5	34.5	—													
13	34.5	35.5	33.0	29.0	33.5	35.5	33.0	33.0	34.5	34.0	33.0	35.5	—												
14	36.0	37.0	34.5	30.5	35.0	37.0	34.5	34.5	36.0	35.5	34.5	37.0	35.5	—											
15	33.5	34.5	32.0	28.0	32.5	34.5	32.0	32.0	33.5	33.0	32.0	34.5	33.0	34.5	—										
16	35.5	36.5	34.0	30.0	34.5	36.5	34.0	34.0	35.5	35.0	34.0	36.5	35.0	36.5	34.0	—									
17	32.5	33.5	31.0	27.0	31.5	33.5	31.0	31.0	32.5	32.0	31.0	33.5	32.0	33.5	31.0	33.0	—								
18	33.5	34.5	32.0	28.0	32.5	34.5	32.0	32.0	33.5	33.0	32.0	34.5	33.0	34.5	32.0	34.0	31.0	—							
19	34.5	35.5	33.0	29.0	33.5	35.5	33.0	33.0	34.5	34.0	33.0	35.5	34.0	35.5	33.0	35.0	32.0	33.0	—						
20	35.0	36.0	33.5	29.5	34.0	36.0	33.5	33.5	35.0	34.5	33.5	36.0	34.5	36.0	33.5	35.5	32.5	33.5	34.5	—					
21	36.0	37.0	34.5	30.5	35.0	37.0	34.5	34.5	36.0	35.5	34.5	37.0	35.5	37.0	34.5	36.5	33.5	34.5	35.5	36.0	—				
22	34.5	35.5	33.0	29.0	33.5	35.5	33.0	33.0	34.5	34.0	33.0	35.5	34.0	35.5	33.0	35.0	32.0	33.0	34.0	34.5	35.5	—			
23	35.0	36.0	33.5	29.5	34.0	36.0	33.5	33.5	35.0	34.5	33.5	36.0	34.5	36.0	33.5	35.5	32.5	33.5	34.5	35.0	36.0	34.5	—		
24	35.5	36.5	34.0	30.0	34.5	36.5	34.0	34.0	35.5	35.0	34.0	36.5	35.0	36.5	34.0	36.0	33.0	34.0	35.0	35.5	36.5	35.0	35.5	—	
25	33.0	34.0	31.5	27.5	32.0	34.0	31.5	31.5	33.0	32.5	31.5	34.0	32.5	34.0	31.5	33.5	30.5	31.5	32.5	33.0	34.0	32.5	33.0	33.5	—
Individual Absolute Accuracy	35	37	32	24	33	37	32	32	35	34	32	37	34	37	32	36	30	32	34	35	37	34	35	36	31

TABLE 8

GOING-CONCERN PREDICTIONS: FURTHER INDIVIDUAL ANALYSIS—RANKING OF SUBJECTS ON ABSOLUTE CONSENSUS AND ACCURACY

Individual Consensus	*Ranking by Subject Number*		*Individual Accuracy*
	Consensus	*Accuracy*	
33.75	12	2	37
33.17	21	6	37
33.13	19	12	37
32.96	10	14	37
32.96	16	21	37
32.92	1	16	36
32.83	6	24	36
32.75	2	1	35
32.71	24	9	35
32.67	23	20	35
32.25	14	23	35
31.71	13	10*	34
31.67	9*	13*	34
31.63	7	19*	34
31.50	20	22*	34
31.46	22	5	33
31.42	5	3	32
31.38	8	7	32
31.29	3	8	32
31.00	25	11	32
30.63	17	15	32
30.46	11	18	32
30.21	18	25	31
29.29	15	17	30
24.96	4	4	24

* Individual subject(s) with median scores on consensus and accuracy.

their individual absolute accuracy scores (35 and 37, respectively). Pairwise absolute consensus (Table 6) ranges from 39 to 16. Pairwise absolute accuracy (Table 7) ranges from 37 to 27. The relationship between consensus and accuracy in this context is highly positive, just as it is in the sales prediction context. The Pearson (Spearman) correlation is .625 (.530).

Individual Analysis

In the going-concern context, *individual absolute accuracy* is the number of cases (out of 40) in which the auditor made the correct going-concern assessment. Individual absolute accuracy is given for each of the 25 auditors at the bottom of Table 7. For example, subject one predicted correctly in 35 of the 40 cases. *Individual absolute consensus* is the mean pairwise consensus over the 24 pairs in which an auditor is included and is shown at the bottom of Table 6. Thus, 32.92 is the mean of the pairwise absolute consensus scores for the 24 pairs in which subject one is included. Consensus ranges from 33.75 to 24.96, and accuracy from 37 to 24. As was true in the pairwise analysis, a strong relationship between consensus and accuracy is observed in these data. The Pearson (Spearman) correlation between individual consensus (Table 6) and individual accuracy (Table 7) is .895 (.818).

TABLE 9

SUMMARY OF RELATIONSHIP BETWEEN CONSENSUS AND ACCURACY

		Correlations Between Consensus and Accuracy	
	N	*Pearson*	*Spearman*
Sales Prediction Task:			
Pairwise Correlational	78	.765	.767
Pairwise Absolute	78	.688	.747
Individual Correlational	13	.956	.973
Individual Absolute	13	.859	.769
Going-Concern Prediction Task:			
Pairwise Absolute	300	.625	.530
Individual Absolute	25	.895	.818

Further Individual Analysis. Further analysis of the relationship between consensus and accuracy is provided in Table 8, which shows that all subjects who scored at or above the median on consensus also scored at or above the median on accuracy. Only one subject who scored below the median on consensus scored above the median on accuracy (subject 20). Thus, the strong positive relationship between consensus and accuracy, captured in the Pearson and Spearman correlations, is also apparent in this further analysis.

DISCUSSION AND CONCLUSION

This study examined the empirical relationship between consensus and accuracy in two prediction tasks of interest to accounting researchers. The results support a strong positive relationship between the two attributes. Across the two prediction tasks and various measures of consensus and accuracy, the mean Pearson (Spearman) correlation was found to be .84 (.82). A summary of the correlations is provided in Table 9.

The relationship between consensus and accuracy was found to hold across two quite different decision settings and a variety of measures. (1) The tasks studied were in different decision contexts of interest to accountants and accounting researchers, i.e., a managerial accounting/budgeting context and an auditing context. (2) Expert subjects in the two experiments brought different training and experience to their respective tasks. (3) The outcome variables in the two tasks were measured differently, i.e., sales predictions were continuous while going-concern predictions were dichotomous. (4) In the sales prediction task, performance was measured in both correlational and absolute terms. (5) Both pairwise and individual measures of consensus and accuracy were used in each task.

While these results provide support for the relationship between consensus and accuracy, further insight into this relationship is needed. In particular, the evidence reported here is not, by itself, sufficient to deny the possible sensitivity of the results to characteristics of the decision context (e.g., complexity) or to changes in environmental conditions. Further research may help to identify characteristics of decision settings which are associated with a strong (or weak) relationship between consensus and accuracy. Replications of this study in additional contexts would increase our confidence in extrapolating the strong relationship between consensus and accuracy found here to settings in which the relationship cannot be verified directly because of the absence of external criteria.

Although additional studies are needed, the present results may be viewed as good news for human information processing research in accounting. The implications may be particularly interesting in auditing contexts in which consensus is sometimes accepted as a practical goal, and for which decision aids have been developed to promote consensus.[5]

However, overconfidence in consensus as a surrogate for accuracy should be avoided. For example, it is conceivable that "all of the people could be wrong all of the time." Further, there is the possibility that an oddball genius, who does not agree with anyone else, could be proved correct by subsequent events.

Barnlund [1959] found that interacting groups often agreed immediately and unanimously on the *wrong* conclusion, so that further deliberation was considered unnecessary. Barnlund warned that, when agreement inappropriately becomes the standard, the virtue of disagreement and the potential contributions of a devil's advocate are lost. In the case of independent individual decisions (instead of those of an interacting group), discovering when the "consensus implies accuracy" assumption is inappropriate may be especially difficult.

Einhorn [1974, p. 570] mentions the oddball genius: "[T]he history of science is replete with oddballs who did not agree with anyone, yet, were proved to be correct by subsequent events." However, Einhorn also observes that the identification of the oddball as a genius requires that some criterion other than consensus become available. As a practical matter, he points out, it may not be feasible to delay decisions and actions until we know who is correct.

A conservative conclusion about the consensus/accuracy relationship based on this analysis is the following: If an individual's predictions agree strongly with those of others in a group, then that individual will tend to be among the most accurate in the group. This conclusion also holds for *pairs* of individuals; that is, pairs who agree better also tend to be more accurate than other pairs. Similarly, individuals and pairs that exhibit low consensus tend to be less accurate than those exhibiting high consensus. Thus, this study supports the assumption that consensus implies accuracy in accounting studies of decision making.

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[5] Ashton [1983] reviews applications and discusses the role of consensus in auditing.

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THE ACCOUNTING REVIEW
Vol. LX, No. 2
April 1985

TICOM and the Analysis of Internal Controls

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ABSTRACT: Auditors are charged with the responsibility of evaluating internal control systems. Recent advances in decision support systems indicate that the speed, accuracy, and memory capacity of computers may be used to aid auditors in this task. To test this proposition, a computer-assisted method of designing, analyzing, and evaluating internal control systems, called *T*he *I*nternal *Co*ntrol *M*odel or TICOM, was designed and implemented. The technical manual and the TICOM software are available from the authors. This paper presents the results and conclusions of that project.

TICOM is a computer-based analytic tool that aids the auditor first to model the internal control system and then to query the model in order to aid the auditor in evaluating the internal control system. TICOM is based on concepts in artificial intelligence such as knowledge representation and graph simplification. It serves (1) to describe office information systems while emphasizing internal accounting controls and (2) as an aid in control evaluation.

It was found that the advantages of TICOM over traditional evaluation methods are that (1) the evaluation can be more rigorous and exhaustive, (2) the documentation of the system can be more thorough because of automated completeness and consistency tests, and (3) the modeler may probe and test controls by using the query-processing portion of TICOM.

INTERNAL control is crucial to any business organization. Without the ability to ensure the accuracy and reliability of accounting information, a business organization could not survive in a competitive environment. Since independent auditors are charged with the responsibility of attesting to the reliability of public accounting information, the design and evaluation of systems of internal control have become important tasks of the accounting profession [AICPA, 1972].

This paper presents a computer-assisted method of designing, analyzing, and evaluating internal control systems. The method is called *T*he *I*nternal *Co*ntrol *M*odel or TICOM, and it has been implemented in the Pascal programming language on a Control Data Corporation Cyber 720 computer. This paper is organized into four parts. Part one presents a general introduction to TICOM. Part two presents some of the technical aspects

The authors gratefully acknowledge the Peat, Marwick, Mitchell Foundation for financial support, encouragement and comments [PMM, 1976].

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*Manuscript received May 1983.
Revision received April 1984.
Accepted August 1984.*

of TICOM. Part three presents some areas for future study. Part four contains the conclusions.

1. INTRODUCTION TO TICOM

Little is known about how auditors evaluate systems of internal control. It is known, however, that almost all practicing auditors employ some model of the internal control system in their evaluation [Mair, Wood and Davis, 1978; Mautz and Winjum, 1981; PMM, 1980]. Such models include questionnaires, narrative descriptions, and flowcharts. TICOM is a computer-assisted method of modeling the information system and querying that model in order to aid the auditor in evaluating the internal control system. Computer-assisted methods have the advantage of bringing the speed, accuracy, and great memory capacity of the computer to bear on the internal control evaluation problem. The result is that the computer-assisted evaluation allows for larger and more complex models, and the evaluation can be more rigorous and intense than when using manual methods.

TICOM has been implemented as a system of computer programs intended as a support aid for auditors in the design, modeling, and evaluation of systems of internal accounting controls. The application of TICOM to a specific control setting is composed of two phases:

1. the design or description of an internal accounting control system, and
2. the evaluation of the resultant model aided by the query-processing capabilities of the TICOM software.

TICOM is composed of two sets of interrelated computer programs:

1. the *I*nternal *C*ontrol *D*escriptive *L*anguage (ICDL) compiler, and
2. the query processor.

These two sets of programs are designed to aid in the two phases of analysis—development of the internal accounting control model and system evaluation—respectively.

A Simple TICOM Illustration

A simple example of modeling an internal accounting control system is presented as an aid to understanding the modeling process. Consider the following description:

> The clerk opens the mail and prepares a remittance advice if one is not present.

This is a narrative description of the system and is itself a model. Narrative description models do not require any unusual skills to prepare or to read. They tend to be lengthy, and different modelers may write very different narrative descriptions.

Flowcharts are another form of modeling. They tend to be concise but they require special skills to prepare and read. Figure 1 is the flowchart for the above example.

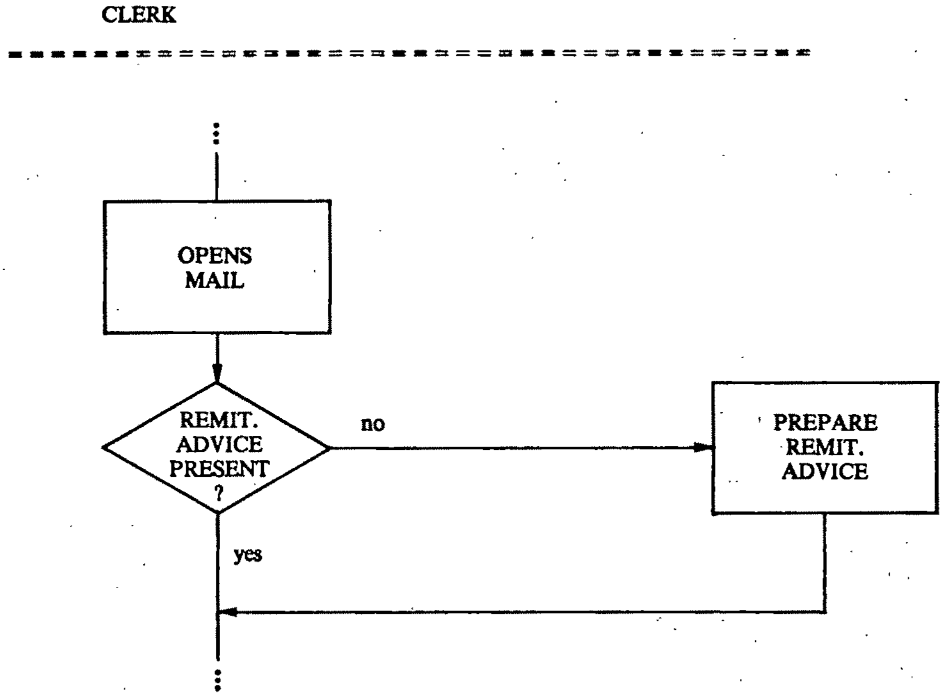
A third form of modeling, the form introduced in this paper, is the computer-based model. The TICOM model for the example appears as follows:

```
CLERK
  (TASK
    GET MAIL;
    IF REMIT-ADVICE NOT EQ
      PRESENT THEN ASSIGN
      REMIT ADVICE;
    END-IF;
  END-TASK)
```

The TICOM model begins with the name of the agent performing the task. The second line of the TICOM model contains the keyword "TASK," which indicates the beginning of the specific steps followed in processing the information. The model ends with the keyword "END-TASK," which indicates that no

FIGURE 1

FLOWCHART OF A SIMPLE SYSTEM



additional steps are to be performed by the agent. Between these two keywords lie the descriptions of the tasks performed by the agent. "GET" and "IF" are TICOM keywords indicating the form of the task. "MAIL" and "REMIT-ADVICE" are user-specified object names identifying things that are manipulated by the agents in the information system. Further details of this internal control description language are contained in a later section of this paper.

The internal control description language (ICDL) of TICOM was designed to be similar to familiar flowcharting concepts. This allows TICOM to capture the same information as is captured by flowcharts. In addition, auditors familiar with flowcharting should be able to learn TICOM without great difficulty.

Once the model is prepared by the person using the ICDL, it is compiled into a computer-readable form by the TICOM programs. Having a computer-readable model, the user may begin analysis of the system using the query processor. The TICOM query processor performs similarly to most query processor languages except that it is custom-tailored to read from the computer-readable model of the internal accounting control system that was compiled from the ICDL description. For the above example, the user may be interested in queries such as:

1. Who has the authority to fill out remittance advices? (The clerk does.)
2. What is required before a remittance advice is filled out? (The clerk must get the mail and the remittance advice must be absent.)
3. What happens if no remittance ad-

vice is present in the mail? (The clerk will fill out one.)

For very large and complex models, a computerized modeling and query aid such as TICOM would have an advantage over manual analyses by using the power of the computer to search the model and extract information. This ensures the accuracy of the query response and allows for more exhaustive analyses. The complexity issue is discussed in Bailey, et al. [1981c].

Audit Application of TICOM

An auditor using TICOM would first perform a traditional review of the system of internal controls. If an extensive evaluation of that system were desired, then the auditor or client would use TICOM to model the system. The TICOM programs would read this model and translate it into a machine-readable form. The auditor could then probe and test the model by querying with TICOM software. For example, a query of a modeled inventory control system might be, "What are the sufficient conditions for inventory to be released from the warehouse?" The auditor would write this query in a form similar to many existing data-base query languages. The TICOM software would process this query and provide a response drawn from the model of the inventory system. The auditor would then interpret the response and incorporate it into the analysis of internal controls.

This is similar to the way in which auditors currently perform this function. First, auditors review the system and its internal controls. Then they generally model the system using flowcharts or written descriptions. This is followed by an analysis of the modeled system to identify strengths and weaknesses. TICOM does not alter this basic approach; rather, it enhances it by introducing mathematical rigor, as well as the speed, accuracy, and ability of the computer to handle large volumes of data as support for the auditors' judgment process.

2. Technical Aspects of TICOM

The TICOM modeling and analysis approach to internal control issues has three distinct components: (1) the internal control description language (ICDL), (2) the internal representation of the model, and (3) the query processor.

The ICDL provides the formal input of the TICOM modeling process and is consistent with the information collected by a number of public accounting firms in their verification of internal control procedures. This formal model is then mapped algorithmically or compiled into an internal representation, the second component of TICOM. As part of the mapping process, the ICDL description is tested for compliance with the syntactic and semantic rules of the ICDL to reduce the probability of misrepresentation errors. In addition, tests are made for certain illogical construction sequences, such as a document being transferred but never received. Each of these cases, the failure of syntactic or semantic rules or illogical construction sequences, must be resolved by the auditor. Failure to properly employ the syntactic and semantic rules of the ICDL should be corrected to obtain an appropriate description of the internal accounting control system. If an illogical construction sequence is reflected in the actual system, it will become a part of the system description. The analysis of the internal controls is aided by the third TICOM component, the query processing system.

Internal Control Description Language

The internal control description language was designed to support the description specifications of accounting internal control systems. Its constructs and

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FIGURE 2

ICDL COMMANDS FOR DESCRIBING INDIVIDUAL OFFICE TASKS

Command	*Description*
ASSIGN attribute-list OF object	Specifies which attributes of a particular object are to be assigned values.
MODIFY attribute-list OF object	Specifies which previously assigned attributes of a particular object are to be reassigned values.
DESTROY object-list	Specifies which objects are to be destroyed.
IF boolean-expression THEN true instructions ELSE false instructions END IF	Specifies a boolean expression, a simple or compound comparison whose truth determines which disjoint set of instructions is to be performed next.
TRANSFER object-list TO agent	Specifies that the data objects listed are to be transferred to another agent or organizational unit.
WAIT FOR object-list	Specifies that the agent's processing is blocked until the objects listed are received.
PUT object-list INTO repository	Specifies that the objects listed are to be placed into the designated repository.
GET object-list FROM repository	Specifies that the objects listed are to be retrieved from the designated repository.
COPY target-object GIVING duplicate object-list	Specifies that the target object is to be copied creating the designated duplicate objects.
TASK	Specifies the beginning of a task.
END-TASK	Specifies the end of a task.
REVIEW	Signifies the entrapment of an error or a discrepancy for which no office procedure is specified to handle the exception.

terminology are closely related to the fundamental concepts and operations associated with internal control and system design. The ICDL consists of (1) agents, (2) objects, (3) repositories, and (4) commands.

Agents are actors in an information system. They are the entities that perform a task. Agents may be individuals, groups, divisions, or subsystems. Objects are the things that are manipulated by the information system. They may be forms, records, assets, or other accounting and system abstractions. The responsibility of manipulating an object is always assigned to an agent in a well-controlled system. Failure to make such assignments is identifiable by TICOM.

Repositories are storage facilities for objects. Examples of repositories include files (both physical cabinets and computer files), inventory bins, safes, and incoming baskets. Agents perform tasks where each task is modeled by one or more commands. The basic commands for describing individual tasks are shown in Figure 2.

The basic commands are powerful enough to capture the essence of tasks and general enough that only a few commands are needed. The "ASSIGN" and "MODIFY" commands relate to an agent filling out a form, keying data, or using other methods of preparing paper or electronic forms. The "ASSIGN" command models the filling out of a blank form while the "MODIFY" command models the permission to correct or adjust previously assigned values. In general, these two commands could be considered to be similar; however, they are different from a control point of view. The "DESTROY" command relates to removing an object from the system. This command seldom would be used in systems with good internal controls, and close attention should be paid to tasks that use this command.

Objects may be passed between agents by the "TRANSFER" and "WAIT-FOR" commands. In a similar manner, they may be passed to and from repositories by the "GET" and "PUT" commands. "COPY" is a command that allows for the replication of an object. "REVIEW" is a general error-trapping command. The final command is the "IF-THEN-ELSE" command. This command serves the function of the diamond in flowcharting. It signifies two branches that can be taken depending on the value of a boolean expression.

In the ICDL, the internal control model consists of definitions of system objects, repositories, and interrelated system tasks, along with the agent who conducts those tasks. The task descriptions focus on modeling the processing required to record transactions. In TICOM, a transaction is defined as the actions required to move a set of system objects from their source repositories to their destination repositories, to their destruction, or to their error-state detection. Knowledge of how single transactions are processed may then be related to situations concerning the concurrent processing of transactions.

System Typing

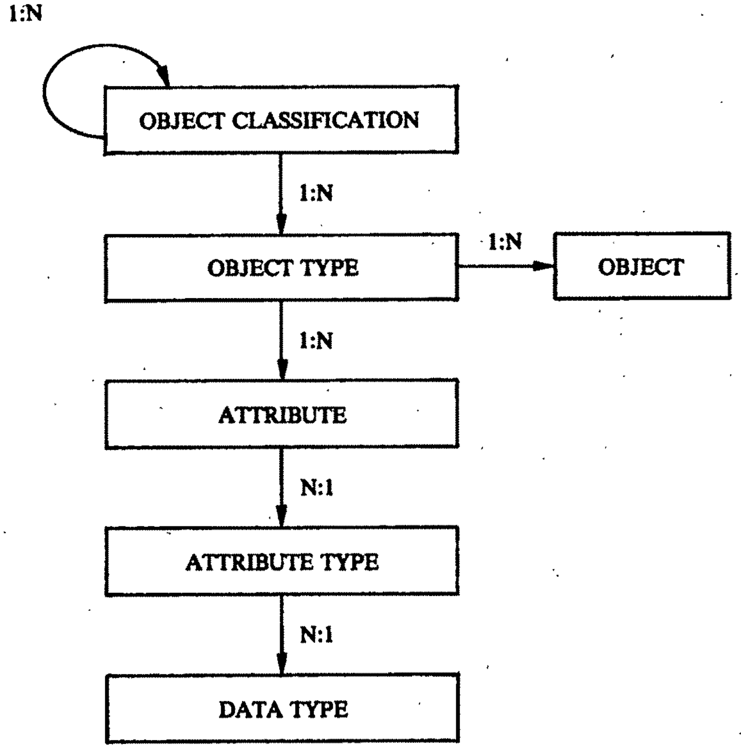
Since internal control systems are not limited solely to the control of documents and electronically stored records (i.e., cash, inventories, adequate insurance, fire protection, etc.), the ICDL incorporates a general mechanism for specifying system objects as abstract types. System objects are abstractions because TICOM does not physically manipulate system objects; rather, it models the operations and their effects.

References to real objects, agents, and repositories are modeled as references to abstract objects, agents, and repositories which are representative of their real-world counterparts. Thus, shipping clerks, for example Jones and Smith, can be modeled collectively in the ICDL by the abstract agent "CLERK" associated with the "SHIPPING-DEPARTMENT." The task descriptions associated with "CLERK" are assumed to be the tasks performed by all shipping clerks. In a more concise way, we can say that Jones and Smith are of type "CLERK." Such collective representation is called typing.

Abstractions are defined by types. For example, let the object "PAYROLL-CHECK" be representative of payroll checks in general. In addition, "PAYROLL-CHECK" is declared to be of object type "CHECKS" since it possesses the attributes necessarily belonging to check-like objects. Two such attributes are "PAYEE" and "DATE-PAID." Further, "PAYEE" and "DATE-PAID" may be typed to specify the nature of the information these attributes convey. That is, "PAYEE" is declared to be of attribute type "NAME," and "DATE-PAID" of attribute type "DATES." The definition is completed by declaring both attribute types "NAME" and "DATE" to be of standard data types, in this case, "CHARACTER" and "NUMERIC," respectively. It is by using object types that TICOM is able to model and test the appropriateness of tasks. Further discussion on typing hierarchy is available in Gerlach

FIGURE 3

FUNDAMENTAL TYPE HIERARCHY SCHEMA



(1:N represents a one-to-many relationship)

[1982]. Figure 3 presents the hierarchy of TICOM object types.

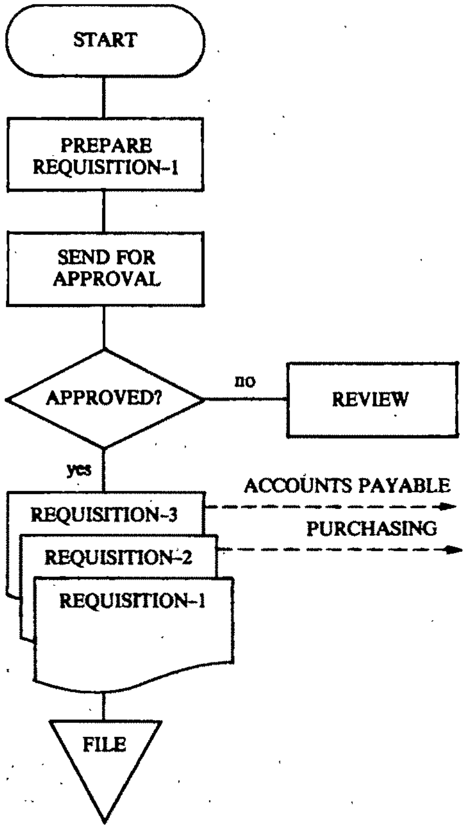
This hierarchy facilitates consistency checking (functional correctness) by type checking and permits the system designer to choose a specification level that emphasizes the significant properties of the objects while ignoring less important aspects. This same facility in choosing a degree of abstraction is available when an auditor or other individual uses the ICDL to describe an existing system. Typing also permits the query processor to access types of objects at specified levels. For example, the auditor may query for access to the object type "ASSETS" or the more specific object type "CASH."

In the ICDL, office activity is described by modularized descriptions of interrelated tasks. The individual tasks are associated with work-related positions. Work-related positions are then classified within departments, divisions, or other organizational units. The functional capabilities of each organizational unit are defined as the sum total of the functional capabilities of its individual members. In this way, the system may be described and analyzed from several organizational perspectives (e.g., along functional lines such as the accounts payable department or along system-processing lines such as cash disbursements.)

Figure 4 illustrates a task description

FIGURE 4
ICDL TASK DESCRIPTION FOR AN ACTIVITY PERFORMED
BY CLERK-1 IN THE STORES DEPARTMENT

FLOWCHART REPRESENTATION



TICOM COMMANDS (ICDL)

```
GET REQUISITION-1 FROM REQUISITION SUPPLY;

ASSIGN SOURCE, DATE, ITEMIZED-DESCRIPTION
OF REQUISITION-1;

TRANSFER REQUISITION-1 TO MANAGER;
WAIT FOR REQUISITION-1;

IF REQUISITION-1 APPROVAL NOT EQ AUTHORIZATION-
CODES THEN REVIEW;

ELSE
  COPY REQUISITION-1 GIVING REQUISITION-2,
    REQUISITION-3
  TRANSFER REQUISITION-3 TO ACCOUNTS-PAYABLE
  TRANSFER REQUISITION-2 TO PURCHASING CLERK
  PUT REQUISITION-1 INTO REQUISITION-FILE
  END-IF;

END TASK
```

written in the ICDL describing the activities performed by "CLERK-1" in the "STORES-DEPARTMENT." Also shown in the figure is a flowchart of the clerk's activities. A comparison of the ICDL to the flowchart illustrates the similarity of the ICDL description to flowcharting. However, there are some differences. For example, the "SEND-FOR-APPROVAL" task only stipulated that "REQUISITION-1" (that is, copy number one of the multipart requisition form) is to be sent to "MANAGER," while no specification is made as to which manager is to receive the requisition.

Similarly, the transfer of "REQUISITION-3" to "ACCOUNTS-PAYABLE" does not designate the agent who is to receive the document. Consequently, any agent in "ACCOUNTS-PAYABLE" with a "WAIT-FOR" command could receive the document. Other cases of nondeterminism appear if, for example, a document is filed and several agents have the authority to extract it from the file. TICOM will attempt to resolve cases such as these during compilation. If TICOM is unable to resolve a case of nondeterminism, a message is generated by the compiler and the auditor must clarify the model. Some forms of nondeterminism can be resolved by modeling the system to a greater level of detail. In all cases, resolution should be possible through the appropriate description of the actual system.

Internal Representation

Once a model has been written in ICDL, the next step is to compile the model producing the machine-readable form of the model, also called the internal representation. TICOM compiles the ICDL model as a precedence-oriented model. Precedence-oriented models depict the internal control system as a set of tasks whose permissible execution sequences are specified by precedence constraints, that is, conditions that must be met before a subsequent action will be taken. This is similar to flowcharts where the order of precedence is assumed to be top to bottom and along connecting arrows, and it is similar to written narratives where the order of precedence is assumed to be left to right along a line of English text.

The general form of the internal representation is a bilogic-directed graph showing both control and data flows. The precedence-oriented model has served as the basis for the Information Control Net office model developed at Xerox PARC [Ellis, 1979]. Other modeling techniques have been proposed, including Zisman's augmented Petri nets [Zisman, 1977] and Omega [Barber and Hewitt, 1980].

Each node of the graph represents some fundamental operation such as document preparation or a consistency test between two documents. This is illustrated in Figure 5. The time at which a node is activated is governed by the completion of the immediately preceding activities. Immediate predecessors of a node *i* are those nodes whose outgoing arcs point to node *i*. A given node may have more than one precedence condition. In such cases, multiple precedence conditions are specified by logical expressions of the incoming arcs. For example, the activation of a node may depend on both of two precedent conditions being satisfied (logical AND), or by either or both (logical OR), or by other logical combinations.

Figure 5 is a simplified fragment of a purchasing subsystem, which illustrates the relationship between the ICDL specification and the precedence graph model. The ICDL procedural description in the example consists of five organizational units, "VENDOR," "RECEIVING," "PURCHASING," "STORES," and "CASH-DISBURSEMENTS." The definition of these units is determined by the system designer or auditor, i.e., they are not fixed or assumed by TICOM. The accounting office system is described by task operation descriptions for each organization module. The interactions of the tasks are inferred by the proper pairing of "PUT" and "GET" commands and of "WAIT-FOR" and "TRANSFER" commands and by the serial ordering of the instructions. For example, the "TRANSFER RR2 TO STORES" in the "RECEIVING" module and the "WAIT-FOR RR2" in the stores module are assumed to match.

To encode this information in the internal representation, a precedence constraint set, called the *PC* set, is introduced. First, numbers are assigned to each operation. Then, to calculate the *PC* set for node *i*, denoted PC_i, let

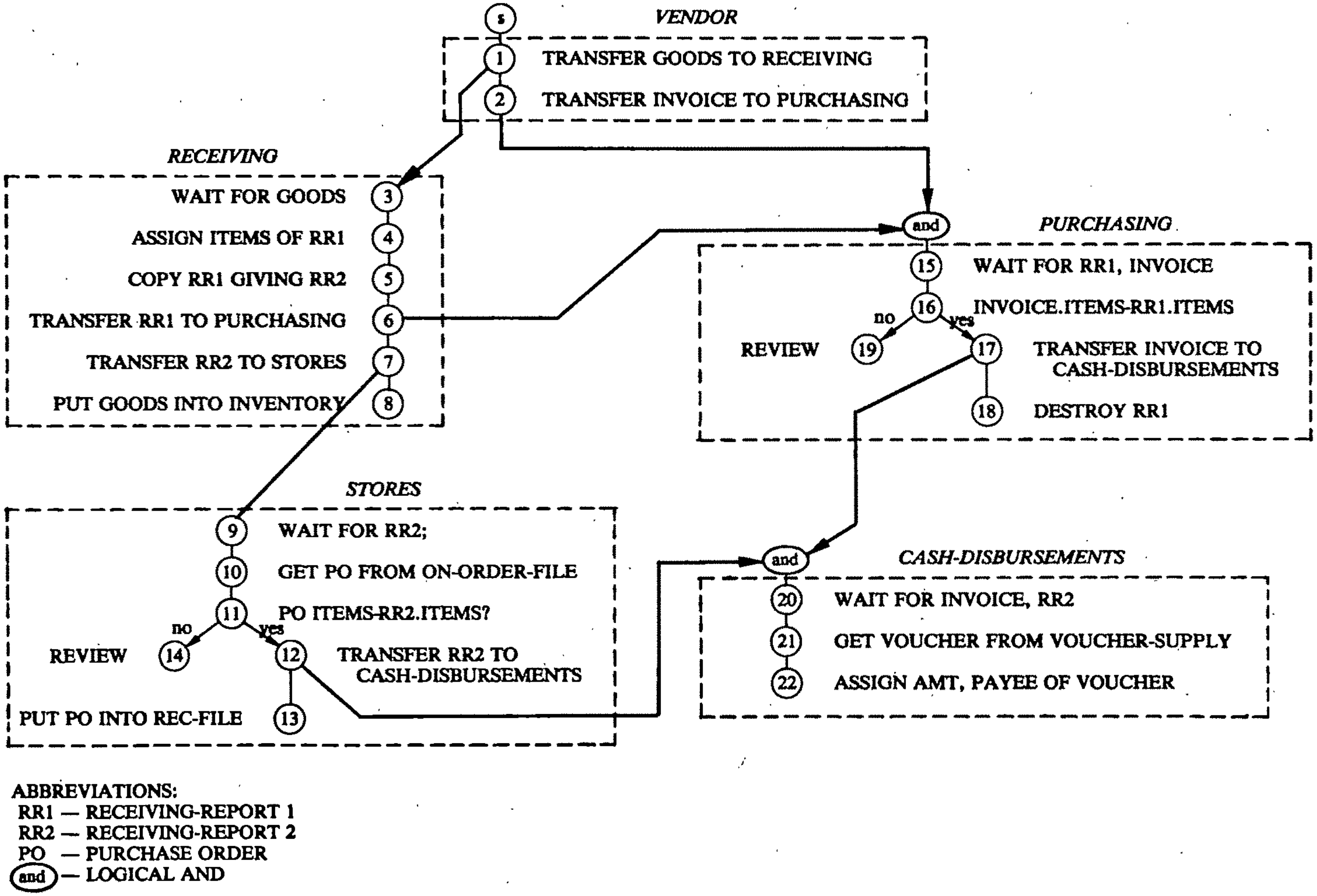
$$((n_1, \ldots, n_k), r_1, \ldots, r_l) \in PC_i$$

> if and only if node *i* follows nodes $n_1, \ldots, n_k$ under the condition r_1 through r_l.

If $((n),r_1) \in PC_i$ and $((m),r_2) \in PC_i$, node *i* can follow node *n* given r_1 is true, or can follow node *m* given r_2 is true. Thus, for

FIGURE 5

A FRAGMENT OF A PURCHASING SUBSYSTEM



example, if node i containing a "GET" command must unconditionally follow both the preceding node (containing any command) and the preceding node m (containing a "PUT" command), then the precedence condition is encoded by $((n,m)) \in PC_i$.

The conditions r_j can have two possible sources. First, any time an "IF" statement occurs, a conditional r_j is assigned if the condition is true with $\sim r_j$ otherwise. Second, when a "TRANSFER" or "PUT" can satisfy more than one "WAIT-FOR" or "GET" command, respectively, fictitious conditions r_k are invented to describe which "WAIT-FOR" or "GET" is satisfied. For example, if a clerk processes a document twice, then when that document is transferred to him, he might use the transfer to satisfy either of his two "WAIT" commands. Thus, an r_k is created to mean he satisfies one of them under condition r_k and the other under conditions $\sim r_k$. Examples of these issues are provided in a later section of this paper.

Because the partial ordering of the ICDL description is explicitly encoded in the internal representation, analytic procedures can operate directly on the internal representation. In particular, nodes can be eliminated and all relationships of the remaining nodes preserved solely by operating on the PC sets in each node [Bailey, et al., 1981a and 1981b].

The simple model of Figure 5 does not illustrate the complexity of accounting internal control systems. Missing from the model are the interactions of the various accounting systems, the clerical and managerial positions within each department, documentation for recording transactions, descriptions of validation, authorization, and approval procedures, and feedback mechanisms for correcting identified irregularities and errors. TICOM is capable of addressing these issues.

Analyzing the Internal Representation

Internal control evaluation consists of examining the system for the presence or absence of specific characteristics that reasonably assure that accounting controls are properly implemented and enforced. Examples of such characteristics are the concepts of separation of duties, controlled access to assets, supportive documentation for business transactions, authorizations, and independent comparisons between accounting documentation and actual assets. These internal control characteristics can be examined through a standard query system operating on a database containing a description of the system [McCarthy, 1978 and 1979]. However, there are important internal control issues for which such a method is deficient. In addition to being interested in the static aspects of the accounting internal control system, accountants are concerned about dynamics, that is, the actions and relationships that must be established for a given accounting transaction to occur. And after the accounting event has occurred, they must verify the existence of documentation and relationships that support the transaction. In addition, office worker compliance with the accounting internal control system and management override involves difficult issues that the accountant must address.

For example, in Figure 5, node 22 represents the preparation of a voucher authorizing payment to a vendor. A systems designer or auditor would be interested in the sufficient operations for this transaction. Tracing backwards through the model, node 21 ("GET VOUCHER") is a precedent condition, but this is not sufficient for the event to occur. Node 20 ("WAIT-FOR INVOICE AND RR2") is also a precedent condition. These two nodes are sufficient for the preparation of the voucher.

However, node 20 ("WAIT-FOR") is not very informative. Tracing further back up the model, node 11 ("ITEMS-PER-PURCHASE-ORDER EQ ITEMS-PER-RR2") and node 16 ("ITEMS-PER-INVOICE EQ ITEMS-PER-RR1") must both be true before the voucher (node 22) is prepared. These two nodes would be of great interest to the accountant. Hence, as far as the evaluation of internal controls is concerned, the most interesting precedent conditions to the preparation of the voucher are (1) that items ordered be the same as items received (node 11) and (2) that items received be the same as items billed (node 16).

Thus, precedent conditions for a given node are all nodes logically above the given node. However, all precedent conditions are not of equal interest to the accountant. TICOM is sufficiently intelligent to distinguish interesting precedent conditions from uninteresting ones by means of reductions, accomplished through contraction and simplification as described below.

Contraction and Simplification

The purpose of contraction and simplification is to distinguish nodes that have internal control implications from nodes that do not. A simple example will illustrate these concepts. Figure 6 shows a very simple graph that might correspond to part of a control system, where the nodes C_i include commands and a split corresponds to a conditional "IF" command. Suppose the auditor wishes to know the condition under which both C_i and C_4 occur. Eliminating all nodes except those identified by the query produces the graphic display of the solution, which is r_1 or r_2. The removal of each node from the graph, corresponding to Figure 6 (a) through (d), is called a contraction. Figure 6 (e) illustrates a simplification wherein "$(\sim r_1$ AND $r_2)$ OR r_1" is reduced to "r_1 OR r_2." Obviously, complex rules are necessary to deal with situations where (1) cycles may exist, (2) two commands (nodes) must be satisfied before a third can begin, or (3) a given transfer can satisfy more than one "WAIT-FOR" command. While these examples are complex, they are mathematically tractable [Bailey, et al., 1981a, 1981b, and 1981c].

Query Processing

The essential feature of query processing is the linkage that controls the analytic procedures. A query can involve several individuals or types of individuals and particular documents or types of documents. Using the type hierarchies and abstractions previously discussed, the query processor can link cited items to all instructions involving those items, thereby identifying instructions whose execution is relevant to the specific query. Those instructions that are not relevant can then be eliminated by the contraction and simplification procedures.

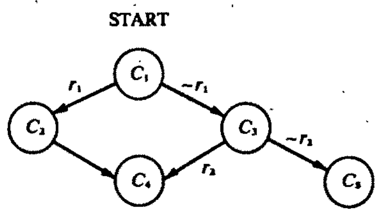
The instructions of analytic interest (that is, those not contracted) are identified by the query processor. As an example, consider the auditor who wishes to query concerning authorization to pay vendors by check. The auditor would like to ask, "Under what conditions could checks be transferred to a vendor without the underlying vouchers being approved?" A formal computer query of this nature would be written:

> WHEN (TRANSFER *y* TO VENDOR BY *q* AND CHECKS (*y*) AND NOT ASSIGN APPROVAL OF *v* BY *p* AND VOUCHERS (*v*))?

The critical commands are located by unifying system instructions against the query. Thus, all transfer statements of the category "TRANSFER *y* TO VENDOR" where "*y*" is of type "CHECKS" are identified as critical instructions.

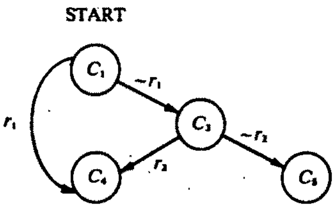
Figure 6

Reduction of a Simple Graph to Eliminate All Nodes Except Those Identified by the Query—That is, the Condition Under Which Both C_1 and C_4 Occur



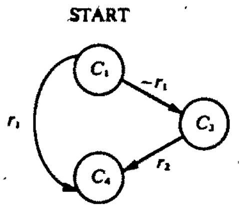
$PC_1 = \{(\text{START})\}$
$PC_2 = \{((1), r_1)\}$
$PC_3 = \{((1), \sim r_1)\}$
$PC_4 = \{(2), ((3), r_2)\}$
$PC_5 = \{((3), \sim r_2)\}$

(a) A simple graph.



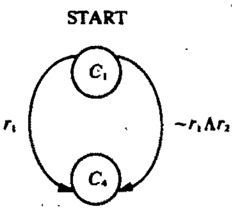
$PC_1 = \{(\text{START})\}$
$PC_3 = \{((1), \sim r_1)\}$
$PC_4 = \{((1), r_1), ((3), r_2)\}$
$PC_5 = \{((3), \sim r_2)\}$

(b) Elimination of C_2



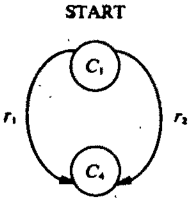
$PC_1 = \{(\text{START})\}$
$PC_3 = \{((1), \sim r_1)\}$
$PC_4 = \{((1), r_1, ((3), r_2)\}$

(c) Elimination of C_5



$PC_1 = \{(\text{START})\}$
$PC_4 = \{((1), r_1), ((1), \sim r_1 \wedge r_2)\}$

(d) Elimination of C_3



$PC_1 = \{(\text{START})\}$
$PC_4 = \{((1), r_1, ((1), r_2)\}$

(e) Logical simplification of C_4

Instructions matching the query's approval instruction have their PC_i set of the selected critical commands modified to "FALSE." This prevents the approval from occurring on the path as demanded by the query. After this, all the noncritical instructions are contracted from the model. Then, for each critical command, in turn, the other critical commands are contracted from the model. The PC_i set of the selected critical commands gives the necessary conditions for that instruction to occur. This procedure is replicated for each critical command. Setting the PC_i elements to "FALSE" for the approval instructions logically blocks all system paths that depend on their occurrence.

The result of this procedure is a substantially simplified subsystem which preserves the properties of the original system with respect to the query. Consequently, it is now only necessary to check whether, and under what conditions, the state mentioned by the query can occur. In this manner, the conditions necessary for the query to be true are generated [Bailey, et al., 1981a, 1981b, and 1983].

In summary, the TICOM approach to modeling and analyzing internal control systems is a hybrid method derived from graph theory and traditional auditing methods. Analogous to flowchart representation, auditors using TICOM describe the accounting system by means of a formal language. The computer then compiles the described system into a graph representation, where the nodes represent actions and the arcs represent precedent conditions. Motivated by the way auditors generally divide the firm into subgraphs called accounting cycles, which incorporate the information on subsets of relationships while ignoring all others, auditors using TICOM may select subgraphs from the total systems model.

This section has provided a limited description of the technical aspects of TICOM. The implementation of TICOM has demonstrated the feasibility of the basic ideas and has led to several extensions of the original TICOM model. Existence of an operating model opens the way for future research.

3. FUTURE RESEARCH

TICOM models the control process and is capable of processing and answering search, status, and what-if types of questions about the described internal control system. TICOM still requires a human expert to (1) identify the likely exposures, (2) hypothesize which questions to ask, (3) interpret the strengths and weaknesses of the various controls, and (4) combine the strengths and weaknesses into an overall evaluation of the system. Further research might extend the TICOM modeling concepts in the above four areas by modeling human experts as they analyze and evaluate internal controls of accounting information systems. Computer programs capable of analysis and judgment at the performance level attainable by human beings are often called expert systems. It is not yet clear that expert systems will be able to perform equally well in all four aspects of the audit evaluation process. However, expert systems have been applied successfully using pattern matching and diagnosis techniques for similarly ill-structured problems. Available evidence suggests similarities between extant applications and auditing tasks. Combining TICOM with such an expert system would allow an automated evaluation of the internal accounting controls within the modeled accounting system [Hayes-Roth, Waterman and Lenal, 1983].

4. CONCLUSIONS

The objective of this project was to enhance the theoretical development of

TICOM and to implement and test the feasibility of the theoretical design. A main goal of the project was the development of a prototype. The computer programs necessary for implementation of a TICOM prototype have been written and tested, and perform in a manner consistent with the original design. Some data processing may not be as efficient as is possible; however, this does not affect the accuracy of the results or the conclusions of this report.

The comments below summarize our conclusions:

1. It is possible to model complex information systems and the concomitant system of internal controls using TICOM.
2. It is possible to use the query-processing capabilities of TICOM as an aid in the evaluation of the system of internal controls.
3. Modeling using TICOM is rigorous. That is, as in any computer language, the modeler must specify clearly and precisely the nature of the information flows and controls. This provides the benefit of protection against errors of omission and inconsistency in exchange for the increased cost of data entry. A user-friendly data entry processor could be added to TICOM to lessen this cost.
4. TICOM provides no guidelines for the overall evaluation of the internal control system once it is modeled. Indeed, there are few rigorous guidelines in the literature. Thus, TICOM does not replace auditor judgment.
5. TICOM has specific knowledge of the internal controls contained in the user-specified model; however, TICOM has no general knowledge of what constitutes strong or weak controls. Future research based on TICOM expert systems may address this matter more fully.

In summary, the computer-assisted modeling and evaluation of systems of internal control is feasible. Additional research is needed to help understand how an auditor evaluates internal control systems and how TICOM can be of greater assistance in this process.

Interested parties can obtain a 300-page report on the TICOM project including the technical details of the ICDL and query processor software. A tape of all software, including several example internal accounting control systems of a more extensive nature, is also available at a nominal charge. Please address requests for this material to Professor Gordon Leon Duke at the University of Minnesota.

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THE ACCOUNTING REVIEW
Vol. LX, No. 2
April 1985

Audit Conflict: An Empirical Study of the Perceived Ability of Auditors to Resist Management Pressure

Michael C. Knapp

ABSTRACT: The objective of this study is to examine how certain contextual factors in auditor-client conflicts affect the perceived ability of auditors to resist client pressure. A review of the literature resulted in the identification of four factors hypothesized to affect sophisticated financial statement users' perceptions of audit conflict outcomes: nature of conflict issue, client's financial condition, provision of MAS by the audit firm, and the degree of competition in the audit services market. A full-factorial, repeated measures ANOVA experiment was conducted using senior loan officers as subjects. The results indicate that a client in good financial condition is perceived as being more likely to obtain its preferred outcome to an audit conflict than a client in poor financial condition. Clients are also viewed as being more likely to obtain their preferred resolution to a conflict when the conflict issue is not dealt with precisely by the technical standards.

CONFLICT between client management and the audit firm is apparently occurring with increasing frequency [Fried and Schiff, 1981, p. 327]. Conflicts having serious implications for the successful completion of the audit are commonly centered around such issues as the need to make adjustments to the financial statements, the propriety of the client's accounting principles, and the adequacy of financial statement disclosure. Recently, the realization that audit conflict is potentially a serious threat to the viability of the independent audit function has spurred the interest of both regulatory authorities and researchers. The Cohen Commission focused on this issue, stating: "Often, the independent auditor's task is to persuade people [management] to do precisely what they do not want to do" [AICPA, 1978, p. 105]. In some cases, however, the party doing the most effective persuading may be client management.[1] The apparent increasing trend of management attempts to influence its auditors' reporting behavior

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[1] In a 1982 discussion of "audit failures," *The Wall Street Journal* [Morris, 1982] reported that clients often appear to be successful in coercing their auditors to go along with questionable accounting practices.

This paper is based on my dissertation at the University of Oklahoma. I would like to thank the firm of Deloitte Haskins & Sells for funding my research and the following members of my committee for their advice and encouragement: Shane Moriarity, Robert Owens, Ned Schrems, Harold Grasmick, and especially my chairman, Bart Ward. The comments and assistance of Ted Mock, James Manegold, Skip Shockley, Doug Andrews, the Editor, and two anonymous reviewers are also gratefully acknowledged.

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Manuscript received November 1983.
Revisions received March 1984 and September 1984.
Accepted September 1984.

resulted in the Cohen Commission reporting that one of its objectives was to examine proposals intended to increase the ability of auditors "to resist management pressure."

Most researchers addressing this problem have discussed the implicit "bargaining process" [Lev, 1979] that occurs in audit conflict situations. This bargaining process typically has been modeled as a power struggle in which management is in a considerably more powerful position than the audit firm [Goldman and Barlev, 1974; Nichols and Price, 1976]. The bargaining advantage of management stems primarily from its control over the current and future audit fees that the audit firm hopes to obtain from the audit relationship. The audit firm also possesses a number of power sources; however, it has been asserted generally that these sources are insufficient to counterbalance management's broad power base.

Because ensuring the continued integrity of the independent audit function has been a concern of the federal government [U.S. Senate, 1976; SEC, 1979] and the financial community [AICPA, 1978], further examination of audit conflict seems warranted. The objective of this study is to examine how bank loan officers perceive the ability of an audit firm to maintain its position in a significant conflict with a client. The audit firm's impartial, professional judgment is extremely important in deciding the nature and wording of the audit opinion. The extent to which a client can exert pressure or is perceived to be capable of exerting pressure on the audit firm to alter the type and/or form of the audit opinion will influence the information that opinion conveys to financial statement users.

Specifically, this study investigates how several contextual factors in audit conflicts affect financial statement users' perceptions of the ability of auditors to resist management pressure. A review of the relevant literature led to the identification of the following factors that may significantly affect users' perceptions of likely audit conflict outcomes: nature of conflict issue, client's financial condition, provision of management advisory services (MAS) by the audit firm, and the degree of competition in the audit services market. An increased understanding of the factors that affect these perceptions should facilitate the profession's efforts to keep the independent auditor's role both credible and viable.

DEVELOPMENT OF HYPOTHESES

Nature of Conflict Issue

Prior research generally suggests that the client's ability to influence the auditor's judgment decreases as the degree of routineness or structure inherent in that judgment increases. For example, Nichols and Price [1976, p. 340] assert that "with highly routine or structured auditing procedures and accounting principles . . . the firm [client] would be less likely to pressure the auditor." They also argue that the less structure inherent in the relevant technical standard, the less likely the auditor is to comply with management demands. One of the few empirical studies of audit conflict [Monger, 1981] yielded results generally supporting the Nichols and Price assertion concerning the likelihood that management will attempt to influence its audit firm's professional judgment. The hypothesis stated below pertains instead to the likely outcomes of such conflict.

H_1: Financial statement users will perceive that management is more likely to obtain its preferred resolution in a conflict with auditors when the conflict issue is not dealt with precisely by technical standards, as opposed to the situation where the conflict issue is dealt with precisely by technical standards.

Client Financial Condition

In an indirectly related study, Schultz and Gustavson [1978] found that actuaries perceived audit firms' risk of legal liability to be inversely related to the relative financial well-being of the client. Client financial condition may also affect perceptions about the resolution of audit conflicts. An audit firm that realizes it has little risk of legal exposure, due to the client's excellent financial condition, may be less motivated to resist management pressure. Knowledgeable financial statement users are also likely to perceive this relationship between client financial condition and the likelihood that the audit firm will capitulate to client pressure.

H_2: Financial statement users will perceive that management is more likely to obtain its preferred resolution in a conflict when the client is in a healthy, as opposed to a poor, financial condition.

Management Advisory Services

For several years, a controversy has existed within the financial community over the scope of professional services provided by audit firms [AICPA, 1978, pp. 95–103]. This controversy centers around the ability and/or desire of public accounting firms to evaluate objectively a set of financial statements while simultaneously providing consulting services to the client. Since 1965 when Schulte examined this issue, several researchers have studied the relationship between perceived auditor independence and the provision of MAS.[2] While results of these studies sometimes have been inconsistent, the available evidence suggests that the provision of MAS adversely affects the perceived independence of audit firms. Similarly, the provision of MAS to a client provides at least an apparent incentive for an audit firm to be less resistant to management pressure in a conflict.

H_3: Financial statement users will perceive that management is more likely to obtain its preferred resolution in a conflict when the audit firm provides a significant amount of MAS to the client as opposed to providing no MAS.

Competition

Both the Cohen Commission and the U.S. Senate subcommittee that investigated the auditing profession concluded that the degree of competition among public accounting firms is not optimal. However, while the Cohen Commission asserted that there is excessive competition among these firms, the Congressional subcommittee argued that there is insufficient competition, especially among the national accounting firms. The limited empirical evidence generally rejects the Senate report [Simunic, 1980].

In Shockley's [1981] study, the most significant experimental variable affecting auditors' perceived independence was the level of competition among audit firms. Those results suggest that user groups may believe that audit firms involved in a conflict with a client may be less willing to resist management pressure when a highly competitive market for audit services exists.

H_4: Financial statement users will perceive that management is more likely to obtain its preferred resolution in a conflict when the market in which the audit firm operates is characterized by a high, rather than low, level of competition.

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[2] Examples of such studies would include Milano [1979], Firth [1981], and Shockley [1981].

FIGURE 1

TREATMENT LEVELS OF INDEPENDENT VARIABLES

	Treatment Level	
	1	*2*
Conflict Issue	Materiality dispute	Disclosure dispute
Client Financial Condition	Good	Poor
MAS	40 percent of audit fee	None
Competition	High	Low

METHOD

Subjects

The primary criterion used in selecting subjects was that they be relatively sophisticated financial statement users. The objective was to select individuals who would understand the importance of the independent audit function and the implications of auditor-client conflict. To satisfy this objective, 70 senior commercial loan officers were randomly selected from the 150 largest commercial banks in Oklahoma.[3]

Of the 70 loan officers contacted, 43 (61.4 percent) agreed to participate in this study and returned usable responses.[4] The participants had a mean length of employment in the banking profession of 17.0 years with a minimum of two years, a maximum of 36 years, and a median of 18 years. Average commercial lending experience was 12.2 years with a minimum of one year, a maximum of 36 years, and a median of 12 years.

Experimental Design and Task

The experiment was a full-factorial, repeated measures design with four independent variables, each of which had two treatment levels as shown in Figure 1. Subjects responded to each of the 16 randomly-ordered cases resulting from all possible combinations of the treatment levels of the independent variables.[5] To provide a higher level of realism, subjects were provided with a concise, narrative explanation of each hypothetical context. The Appendix presents an example. After each case, subjects were asked to record their perceived likelihood that management would obtain its preferred resolution to the dispute. Subject responses were recorded on a seven-point Likert scale.

One-half of the cases involved a conflict issue which is dealt with quite explicitly by the technical standards.[6] The client and audit firm disagreed over whether a subsequent event should be disclosed. The technical standards clearly supported the position taken by the audit firm—disclosure of the event. The remainder of the cases involved the materiality of a financial statement amount, an issue which is not dealt with as explicitly by the technical standards.[7] The client

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[3] The sample was selected from the 1982 membership directory of the Oklahoma Banking Association.

[4] In the related study by Shockley [1981], 67.2 percent and 60.9 percent response rates were obtained from comparable samples of commercial loan officers and chartered financial analysts, respectively.

[5] To determine whether an order effect influenced subjects' responses, two versions of the research instrument were used, each with a different random ordering of the cases and the independent variables within each case.

[6] Paragraphs 560.05–.06 of *AICPA Professional Standards, Volume A* [AICPA, 1983a] discuss quite explicitly what types of subsequent events must be disclosed.

[7] The most recent treatment of the concept of materiality in the technical standards can be found in *SAS*

TABLE 1

ANALYSIS OF VARIANCE FOR ALL MAIN EFFECTS AND FIRST-ORDER INTERACTIONS

	F	*p*	*Percent of Variance Explained*
Main Effects			
I Conflict Issue	184.91	<.001	11.58
F Financial Condition	260.16	<.001	15.82
M MAS	25.96	<.001	1.58
C Competition	23.38	<.001	1.42
Interactions			
IF	20.94	<.001	1.27
IM	3.92	>.05	.24
IC	.66	>.42	.04
FM	.09	>.77	.01
FC	.00	>.97	.00
MC	.09	>.77	.01
			31.97

Note: Repeated measures ANOVA designs use the mean square associated with the specific treatment-subject interaction as the *F*-ratio denominator. None of the second or higher order interactions were significant at a .01 level.

and audit firm could not agree on the materiality of a proposed financial statement adjustment. The audit firm believed the adjustment was necessary, but the technical standards did not provide explicit, authoritative support for that position.

The three remaining independent variables were also dichotomous, as shown in Table 1. One treatment level for the financial condition factor described a client that was in fairly good and improving financial health while the other treatment level communicated just the reverse. For the MAS[8] and competition variables, the initial treatment levels represented a fairly high presence of each factor while the second treatment levels represented the absence of the factor. The Appendix contains examples of how the treatment levels were presented narratively to the subjects.[9]

RESULTS

This section presents the primary empirical findings. First, the composite ANOVA model for the entire subject sample is presented; second, the individual subjects' ANOVA models are discussed.

Overall Analysis

Table 1 presents the ANOVA results for the combined sample. The marginal means for the treatment levels of each independent variable are shown in Table 2. For each independent variable, the direc-

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No. 47, Audit Risk and Materiality in Conducting an Audit [AICPA, 1983b]. As in past authoritative pronouncements concerning materiality, this technical standard does not provide any definitive criteria for determining what, in fact, is a material amount.

[8] For a random sample of one hundred SEC registrants in a study by Reckers and Stagliano [1981], approximately three-fourths paid an amount less than 40 percent of the annual audit fee to their audit firms for MAS rendered. (The mean percentage paid was 38 percent.) Consequently, for purposes of this study, a significant amount of MAS rendered to the audit client was deemed to be 40 percent of the annual audit fee.

[9] The research instrument was pretested by administering it to a sample of fifteen commercial loan officers. As a result of the pretesting, several changes were made in the instrument.

TABLE 2

MARGINAL MEANS FOR TREATMENT LEVELS OF INDEPENDENT VARIABLES

	Treatment Level	
	1*	2
Conflict issue	3.92**	2.70
Financial condition	4.03	2.58
MAS	3.53	3.08
Competition	3.52	3.09

* Figure 1 summarizes the treatment levels of each independent variable.

** Higher scale scores indicate a higher perceived likelihood that the client will obtain its preferred outcome to the audit conflict. (The seven-point scale used by the subjects is included in the Appendix.)

tional impact on the dependent measure was as hypothesized. However, the effects of the conflict issue and client financial condition factors were much greater than those of the other two factors, as shown by the percentages of explained variance reported in Table 1. The relatively large impact of these two variables on subjects' judgments is also evident in Table 2, which shows a much greater difference in the marginal means for those factors than for either the MAS or competition factors.

No research hypotheses were established to predict interaction effects between or among the independent variables. Table 1 reports that only one of the first-order interactions, conflict issue-financial condition, was significant at the .01 level. This significant interaction demonstrates that auditors are perceived to be most susceptible to client pressure in those situations where the client is financially strong and the conflict issue is not dealt with precisely by technical standards.

Individual Models

Judgment consensus among subjects in an ANOVA study can be evaluated by analyzing the frequency of significant effects in the individual subjects' models and the consistency of the directional impact of the significant effects. In Table 3 the number of significant effects for each independent variable is reported as well as the number of times the significant effects were inconsistent with the hypothesized directional impact. The subjects' judgments generally were significantly influenced in the hypothesized direction by the client financial condition factor. The conflict issue factor was significant in 79 percent of the individual models but there was some lack of consensus as to its directional influence. Consistent with the results reported in Table 1, Table 3 shows that the MAS and competition factors had a relatively modest impact.

The total amount of variation in the loan officers' judgments accounted for by the composite ANOVA model was 31.97 percent (Table 1). Even in studies where the amount of variance explained in the combined ANOVA model is modest, the variance explained by the individual models can still be substantial. For example, variance explained for individual subjects in the Schultz and Gustavson [1978] study ranged from a minimum of 86.4 percent to a maximum of 100 percent with a mean of 93.2 percent, even though the variance accounted for by the combined ANOVA model was only 30.1 percent. In this study, the mean variance in subjects' judgments explained by the in-

TABLE 3

FREQUENCY OF SIGNIFICANT EFFECTS CONSISTENT AND INCONSISTENT WITH RESEARCH HYPOTHESES

Effect	*Significant* Effects Consistent with Hypotheses*	*Significant* Effects Inconsistent with Hypotheses*	*Total*
Conflict issue	30	4	34
Financial condition	37	1	38
MAS	16	0	16
Competition	20	1	21

* $p \leq .05$

dividual models was 93.6 percent with a range from 68.2 to 100 percent.

DISCUSSION

The first research hypothesis (H_1) suggests that greater subjectivity in technical standards decreases the audit firm's perceived ability to withstand pressure exerted by the client. The empirical results are consistent with this hypothesis. The implication for the auditing profession is that promulgatory authorities may need to consider a move to define technical standards more explicitly. It is likely that such action would not only diminish the frequency with which significant conflicts occur as demonstrated by Monger's [1981] study, but it would also probably strengthen the perceived and *de facto* ability of auditors to withstand client pressure.

The results also support the second hypothesis (H_2) suggesting that the healthier a client's financial position, the greater its perceived ability to obtain its preferred outcome to an audit conflict. One possible explanation for the loan officers' perceptions is that they perceived audit firms to weigh consciously the risk of compromising behavior. In the case of a client in solid financial condition, the likelihood of the audit firm being asked to account for a questionable decision is so remote that the expected losses from such an action would be minimal. This argument can be derived from an economic analysis of the auditor's role such as that presented by DeAngelo [1980]. This approach does not invoke *de facto* independence or integrity but views auditors as economic creatures who weigh the costs and benefits of alternative actions. DeAngelo's analysis implies that imposing punitive financial sanctions that make self-serving behavior by audit firms economically unattractive would decrease the effectiveness of management pressure.

With respect to the third and fourth research hypotheses, the empirical results are not conclusive. Each of these factors proved to be statistically significant at a .001 level; however, the absolute amount of variance in subjects' judgments explained by these factors was minimal. The most defensible conclusion is that a high degree of competition in the audit market and the provision of a significant amount of MAS by an audit firm each slightly increases the apparent likelihood of a conflict being resolved in favor of the client.

The relative weakness of the competition factor is surprising given the earlier findings of Shockley; the competition factor explained more variance in his composite ANOVA model than any other main effect or interaction. In attempting to explain these differing results, one must look at the experimental context in each study. Shockley addressed the impairment of auditors' perceived independence in a strictly general, unspecified context. Apparently, on a macro level, the competition issue is very relevant in determining whether the profession's credibility is being damaged. However, in the specific context of an audit conflict, degree of competition does not have a major influence on users' perceptions of auditors' ability to resist management pressure.

In the Shockley study, the MAS variable was significant for the class of commercial loan officers; however, in terms of explanatory power, it accounted for less than one-half of one percent of the variance in those subjects' judgments. The results of the current study are consistent with those of the Shockley study. The amount of MAS provided to clients is a factor that financial statement users consider in evaluating auditor independence and integrity in a generic sense as well as in specific situations where the auditor is being pressured by the client. However, in neither context is this variable a major factor in users' assessments.

The findings and conclusions of this study are subject to a number of limitations. For example, the length of the research instrument may have diminished the degree of conscientiousness of the subjects. However, the relatively high mean percentage of variance explained by the individual ANOVA models indicates that the subjects were not responding randomly to the conflict scenarios. One challenge to the external validity or generalizability of the results is the possibility of response bias. In assessing response bias, data obtained from the 13 subjects responding to the second requests for participation were compared to data provided by the 13 earliest respondents. At a .05 level, no statistically significant differences were found between the two groups' mean responses on any of the 16 data points.

A similar test was performed to determine whether internal validity was jeopardized by an order effect. Two versions of the research instrument were used with different random orderings of the cases and the independent variables within each case. Each version was used by approximately one-half of the subjects. At a .05 significance level, no differences were found between the mean responses on each data point of the two groups that completed the different versions of the instrument.

Another threat to the integrity of this study's empirical results and one that limits their generalizability is the artificial nature of the experimental setting. The factors that were hypothesized to affect loan officers' perceptions of the ability of auditors to resist client pressure were presented in a much more explicit manner than they would occur in a real setting. Additionally, since a repeated measures design was used, subjects may have become oversensitized to the research variables and, as a result, may have been able to determine the research hypotheses. Previous researchers [Libby, 1979; Pany and Reckers, 1980] that have used experimental designs with repeated measures have commented on the possibility that their results were influenced by "experimental demand"—that is, subjects attempting to respond cooperatively with the researchers' hypotheses. In this study an effort was made to reduce the likelihood of this type of reaction by presenting the research materials and wording the instructions for the experimental task in as neutral a manner as possible, an approach suggested by Campbell [1957].

The implications of audit conflict are both numerous and pervasive. This study was an initial effort to explore one dimension of this problem. Apparently, financial statement users are becoming aware of the existence of considerable conflict in audit engagements, and such awareness may eventually damage the credibility of audit firms. If audit firms are to retain their important role in the financial reporting process, research needs to be undertaken to determine how to reduce the frequency of conflict in the audit context as well as how to manage this phenomenon in a constructive manner.

Appendix

Scenario A

Jackson Manufacturing is a publicly-owned producer of electronic equipment used in hospitals and medical laboratories. Jackson is audited by a local office of a national public accounting firm. In the current year's audit, a dispute between Jackson and its auditors has arisen over the materiality of certain unrecorded liabilities discovered by the auditors. The unrecorded liabilities consist primarily of expenses incurred in 1981 that were neither paid nor recorded in Jackson's accounting records until 1982. Jackson's controller argues that the total amount of unrecorded liabilities is immaterial and that it is therefore unnecessary to adjust the financial statements in this regard. The auditors feel the amount is material and that the 1981 financial statements should be adjusted accordingly. Technical accounting standards provide very little guidance in determining the materiality of given amounts in financial statements, and thus, Jackson's management believes it should know as well as anyone what financial statement readers would or would not deem to be a material amount. Other available facts include:

Case #1

—Jackson's overall financial condition is quite good. All of the firm's solvency and profitability ratios compare favorably to industry averages. Net income has shown a modest but steady growth pattern over the last five years.

—Jackson's auditors are also currently working on a large management consulting project involving Jackson's cost accounting system. The consulting engagement will most likely not be completed for another twelve months. The total fee for this project is expected to be equal to approximately 40 percent of the current year's audit fee.

—The immediate audit market within which Jackson's auditors compete is characterized by a number of large auditing firms that are aggressively pursuing practice development (expansion) programs.

In your view, given the above information, how likely is it that the unrecorded liabilities will be ignored for purposes of the financial statements as well as the auditor's report, which is the alternative that Jackson's management desires? Record your answer by circling the most appropriate number on the following equal-interval scale.

Very Low Likelihood 1 2 3 4 5 6 7 Very High Likelihood

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THE ACCOUNTING REVIEW
Vol. LX, No. 2
April 1985

Process Susceptibility, Control Risk, and Audit Planning

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ABSTRACT: The audit risk model was used to generate hypotheses concerning the effect that internal control evaluation exerts on audit planning decisions. Specifically, directional predictions concerning the contingent nature of the effects of the susceptibility of accounting processes to error, the strength of the internal control design, and the strength of the related compliance tests were developed. These hypotheses were then compared to the behavior exhibited by a group of experienced auditors who completed a highly realistic series of case studies. The auditors' decisions were consistent with the predictions developed from the audit risk model. In addition, the paper introduces a modification of the standard policy-capturing method that allows the use of complex realistic case materials in a powerful, internally valid experimental design which decreases problems with experimental demand. It also provides initial evidence on experts' perceptions of the effectiveness of different approaches to compliance testing and further evidence on auditor consensus in a more structured audit environment.

INTERNAL control evaluation and its audit planning implications have been the primary focus of audit decision making research. Beginning with Ashton's [1974] initial study, prior experimental research has examined the impact of different control system attributes (or changes in these attributes) on control strength ratings or audit planning decisions pertaining to substantive tests (see Joyce and Libby [1982] and Ashton [1983] for a review). The realism of the case materials and the backgrounds of the subjects have varied widely, but the principal thrust and findings of the research have been consistent. In addition, these studies have two important weaknesses in common. First, they do not employ a conceptual or theoretical model to predict the direction, magnitude, or contingent relationships among the examined effects. Such a model would ease the process of interpreting results, evaluating their implications for practice, and planning a coherent program of research. Second, prior researchers have focused primarily on the effect of numerous internal control *design* attributes on audit planning decisions. Planned compliance test *strength* and the *results* of these tests should also affect planning decisions. The effects of planned compliance test strength have not been examined systematically and the effects of test results

We are indebted to Bob Ashton, Steve Butler, Bob Elliott, Peter Jacobson, Bill Messier, Ken Trotman, and especially Bill Butler and Bill Kinney for their helpful comments on earlier drafts of this paper.

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Manuscript received April 1984.
Revision received November 1984.
Accepted November 1984.

have only been the subject of limited study.

The most widely accepted conceptual model for integrating internal control evaluations into the audit planning process is the audit risk model in its various versions [AICPA, 1981, 1983; CICA, 1980]. The most recent version of the model defines audit risk (AR) as "the risk that the auditor may unknowingly fail to appropriately modify his opinion on financial statements that are materially misstated" [AICPA, 1983, par. 2]. Audit risk is assumed further to be a multiplicative function of (1) *inherent risk,* (2) *control risk,* and (3) *detection risk.* The role of normative models in descriptive research has received much attention in recent years (e.g., Einhorn and Hogarth [1981]). In the current paper we use the audit risk model as a first approximation of human behavior to form a basis for generating falsifiable hypotheses. In much the same manner that Bayes' Theorem was used and replaced by heuristics and biases as a descriptive model of human judgment under uncertainty [Kahneman, Slovic and Tversky, 1982], eventually we may modify or replace the audit risk model as a model of audit judgment.

Even though a number of operational issues remain unresolved (see Cushing and Loebbecke [1983a] and Kinney [1983]), the model suggests certain specific characteristics of the effect that internal control evaluation *should* exert on audit planning decisions and its interactions with the other components of audit risk. Thus, it provides an initial basis for developing predictions of certain attributes of audit planning decisions.[1] The purpose of this paper is to develop and test some of these characteristics at the level of individual information processing streams, which, as noted by Cushing and Loebbecke [1983a] and SAS No. 47 [AICPA, 1983], is the level at which such judgments must be made in practice. Specifically, directional hypotheses are developed concerning the effects on audit planning decisions of the susceptibility of a process to error and two components of control risk (internal control strength and compliance test strength). These hypotheses are compared with the decisions of experienced auditors who completed a series of highly realistic case studies.

THEORY AND HYPOTHESES

The most recent auditing standard on audit risk [AICPA, 1983, par. 20] defines the three components of audit risk as follows:

(1) *Inherent risk* (IR) is the susceptibility of an account balance or class of transactions to error that could be material . . . assuming that there were no related internal accounting controls.
(2) *Control risk* (CR) is the risk that error . . . that could be material . . . will not be prevented or detected . . . by the system of internal accounting control.
(3) *Detection risk* (DR) is the risk that an auditor's procedures will lead him to conclude that error . . . that could be material . . . does not exist when in fact such error does exist.

Because the components are defined conditionally, they are by definition independent and thus can be combined multiplicatively as in equation 1:

$$AR = IR \times CR \times DR. \qquad (1)$$

To employ the risk model in audit planning, the auditor must first decide on the acceptable level of audit risk. Then, inherent risk and control risk are assessed and the appropriate level of detection risk is determined. As noted in SAS No. 47, "As the auditor's assessment of inherent risk and control risk decreases, the detection risk that he can accept increases" [AICPA, 1983, par. 25]. Detection risk determines the appropriate amount of substantive testing to perform.

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[1] It is not the purpose of this paper to argue the appropriateness of the model for practice (see Cushing and Loebbecke [1983a] and Kinney [1983]) nor to argue how normative models should be used in descriptive research. Further, we make no normative statements about the behavior uncovered in the study, only its adherence to those aspects of the model we have investigated. Such evaluations are left to the reader.

Because inherent and control risk are combined multiplicatively in the model, the impact of a change in control risk on the appropriate level of detection risk (and thus the appropriate level of substantive testing) depends on the level of inherent risk. More specifically, the greater the level of inherent risk, the greater the magnitude of the effect of a given change in internal control risk.[2] For example, if inherent risk is assessed as .3 and control risk increased from .2 to .4, the *combined risk* that a material error would occur and not be corrected by the control system would increase from .06 to .12. However, if inherent risk had been twice as large, .6, the size of the increase in combined risk also would double, changing from .12 to .24.

Process Susceptibility

The model can be applied to the series of steps by which a specific type of transaction data is processed to produce changes in general ledger accounts (e.g., the series of processes which convert a purchase voucher package to a debit to purchases and credit to accounts payable). Inherent risk at this level is the susceptibility to material error of the processing *stream*.

At an even more disaggregated level, the model can be applied to the individual accounting *processes* that make up the processing stream (e.g., the manual preparation of a purchase input form from data in the voucher package). If we employ the same definitions as before, the same principles will apply. Inherent risk at the individual process level is the susceptibility of the individual process to intolerable error.[3] We shall call this risk *process susceptibility*. The *combined risk* that an individual process will generate intolerable error which will not be prevented or corrected by the control over that process is the product of the susceptibility of the process and one minus the assessed effectiveness of the control over the process. As above, the effect on allowable detection risk of a change in control risk relating to an individual process will be greater, the more susceptible the process to error. Thus, an increase in the control risk over a process which is *not* very susceptible to error should have a smaller effect on the extent of substantive testing than the same change in control risk related to a *highly* susceptible process in the same processing stream.

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[2] A common criticism of the audit risk model relates to the lack of independence of inherent risk and control risk, which brings into question the multiplicative combination of the components (see Cushing and Loebbecke [1983a, pp. 29–30]). This problem was dealt with in the most recent version of the model by including detection and *prevention* effects in the definition of control risk and conditioning inherent risk on the existence of no related controls. Thus, they are independent by definition. However, this does not eliminate all related assessment problems. It is important to note that, in the current study, we assume only that control risk changes have *greater effects* at higher levels of inherent risk. This assumption is less restrictive than the independence assumption achieved through the new definition. We are unaware of any criticisms of this less restrictive assumption.

[3] Intolerable error for the process is the amount of error that, when aggregated with other error over the entire processing stream, will be less than or equal to tolerable error for the processing stream. SAS No. 39 [AICPA, 1981] discusses a similar allocation of planning materiality to accounts and classes of transactions. Cushing and Loebbecke [1983a, pp. 28–29] discuss this allocation in their analysis of the audit risk model at a disaggregated level. We are not suggesting that all auditors make such assessments; only that the same principles in the audit risk model apply to this less aggregated level. Interactions between individual accounting processes/internal controls create aggregation problems which are an important limitation of applying the model at higher levels of aggregation.

Consider the following example of a processing stream which results in the recording of raw materials purchases and the related accounts payable and cash disbursements. Such a stream would include a number of individual processes which could contribute to a material error in these accounts. One of these processes (denoted process 1) involves the weekly manual preparation of a purchase input form detailing all of the information from the purchase vouchers to be keypunched for computer processing (e.g., voucher number, vendor, quantity, and dollar amount by account, due date). Another of these processes (denoted process 3) involves the weekly running of a standard computer program which combines the punched card data prepared from the purchase input forms with the open accounts payable file to produce an updated file and a hard-copy weekly voucher report. Presumably, the manual preparation of purchase input (process 1) would be more likely to contribute greater error to these accounts than the running of a standard program. If this were the case, then a five percent decrease in the effectiveness of a control over more susceptible process 1 should result in a greater increase in the extent of substantive testing than a five percent decrease in the effectiveness of the control over the less susceptible process 3.

It is worth noting at this point that a major source of criticism of the audit risk model relates to aggregation problems—how evaluations at the individual process level can be summed up to the account or financial statement level. Thus, it is in fact *more* reasonable to apply the model at a disaggregated level as in the present study than to higher levels. (See Cushing and Loebbecke [1983a, pp. 28-29].)

Control Strength and Test Strength

Current professional standards relating to the evaluation of control risk outline the two steps involved in that process: (1) the review of the system after which the auditor should be able to make a preliminary evaluation of the system design *assuming compliance* with prescribed procedures which we will call *control design strength* (CD), and (2) assessment of compliance with these procedures (AU 320.50). Assessment of compliance can be expressed as the risk of overreliance on internal control due to *lack of compliance* with prescribed procedures and will be a function of the conclusiveness of the test, which we will call *test strength* (TS), and the test result (TR). For detail compliance tests, test strength will be determined by the appropriateness or relevance of the test and the sample size, and the test result is the number of deviations. The strength of compliance tests which involve inquiry and observation of personnel and office routines and the test result must be a matter for the auditor's judgment. An auditor's final assessment of control risk should then be a function of control strength, test strength, and test result as expressed in equation 2:

$$CR = f(CD, TS, TR). \qquad (2)$$

The exact form of this function has not been specified in the literature. Such specification is not necessary for our purposes since we rely only on the direction of the three effects on control risk.

As noted earlier, the *combined risk* that a process generates intolerable error which will not be corrected by a control is the *product* of the susceptibility of the process and control risk. This leads to the conclusion that the effect of a given change in control risk on combined risk, and therefore on the necessary level of substantive testing, will increase as the susceptibility of the process increases. Since control risk is a function of control strength, test strength, and test result, the effect of a change in any of these three components must also increase as the susceptibility of the process to error increases. Returning to our earlier example, a lower assessment of control strength, employment of a weaker test (a less appropriate test or smaller sample size), or finding a poorer test result relating to our more susceptible manual process (process 1) should have a greater effect on the assessment of combined risk and the extent of substantive testing than if the same change occurred in our less susceptible automated process (process 3), all other things being equal.

While these detailed predictions have not been examined experimentally, the psychology literature (see Kahneman, Slovic, and Tversky [1982]) suggests that decision makers often make use of simplifying rules, which are even less complex than the multiplicative rule described above. Lens model research points to the use of simple additive rules and probabilistic judgment research indicates that compound probabilities are not well understood (see Libby [1981] and Ashton [1982]). Further, while the application of the audit risk model at the processing stream level is discussed in the authoritative literature (SAS 39 [AICPA, 1981] and SAS 47 [AICPA, 1983]), the details of such an application are not. This is probably due to the early stage of development of the model. Therefore, whether or not auditors' intuitive judgments are consistent with the above predictions is an open question.

The experiment reported in this paper was designed to test these predictions relating to two elements of the effects of control risk on combined risk—changes in control design strength and test strength. In our experiments, the assessment of combined risk is captured in a *control reliance* rating which is discussed in the next section. Restated as hypotheses, the audit risk model suggests:

H_1: An increase in *control risk* related to a more susceptible process will result in a greater reduction in control reliance than the same change in a less susceptible process.

H_2: A decrease in *control design strength* related to a more susceptible process will result in a greater reduction in control reliance than the same change in a less susceptible process.

H_3: A decrease in *test strength* related to a more susceptible process will result in a greater reduction in control reliance than the same change in a less susceptible process.

The experiment also provides initial evidence of auditors' perceptions of the relative strength of detail compliance tests versus inquiry and observation and of the ability to increase the strength of inquiry and observation through additional procedures. These latter two issues have direct bearing on the relative efficiency of different audit strategies since the costs of these different compliance tests can vary significantly.

Joyce [1976], Mock and Turner [1981], and others have reported lack of consensus among the audit planning decisions of different auditors within the same firm. Since these studies were conducted, there have been some dramatic changes in the audit approach of some major firms. Many of these changes have involved adding structure to the audit in an attempt to increase consensus [Cushing and Loebbecke, 1983b]. This study will provide initial evidence of judgmental consensus in a more structured environment. The experiment, which employed a new variation of policy-capturing methods, is described in the next section.

METHOD

The experiment required each participating auditor to provide control reliance ratings for a series of audit cases where certain attributes were manipulated systematically using a variation of Hoffman, Slovic, and Rorer's [1968] analysis of variance method for describing judgment policies. This method has been applied in accounting contexts by Ashton [1974] and others, and the variation used is most closely related to Libby [1979] and Wilkins and Zimmer [1983]. Specifically, the strength of the controls and the strength of the compliance tests over processes of differing levels of process susceptibility were manipulated. The case materials closely mimicked the workpaper format of the participating firm (see Elliott [1983], for a complete description). All materials were reviewed by members of the firm's audit practice division and were pilot-tested on four audit supervising seniors and managers.

Procedure

Each auditor was presented through the mail with a booklet including instructions, unchanging background information, eight case versions containing specific information pertaining to the evaluation of internal control, and a biographical questionnaire. Subjects were told that the purpose of the case study was to determine the degree of reliance that would be placed upon the set of controls relating to accounts payable. The purpose of the evaluation was to determine the degree to which requests for year-end open item statements from known vendors might be restricted. No attempt was made to hide the differences among the case versions as our interest lies not in questions of attention, but in the features of the processing rule. However, the nature of the hypotheses was hidden from the participants. Subjects were allowed as much time as they deemed necessary for the task. The use of reference materials was allowed but consultation among participants was prohibited. After the booklets were completed, they were mailed back to the executive office of the firm.

Background Information

The unchanging background information included a general company overview, a detailed narrative description of the purchasing-disbursements cycle, completed workpapers for the boundary controls (controls over the collection of information about exchange transactions), and the control point flowchart documenting the processes which convert the transaction data to account postings. The general overview described "Better Beverage Company" (BBC), a privately held manufacturer and distributor of soft drinks with sales of $30 million. BBC, which had been a firm client for ten years, was described as financially healthy, adequately control-conscious, and staffed by competent personnel. These control environment attributes affect the overall susceptibility of the system to error and set a lower limit on the overall evaluation of control risk and an upper limit on control reliance. The positive constant level chosen for these attributes allows for the maximum variation in control reliance. The audit firm was engaged in a full scope opinion audit.

In the narrative description of the purchasing-disbursements cycle, each process related to requisitioning and ordering, receiving, invoice approval, vouchering, processing of vouchers, processing of disbursements, preparation of monthly reports, and journal entries and reconciliations was described in detail. Evaluations of all boundary controls and the relevant compliance tests and results were included in the boundary workpapers. No control or compliance problems were in evidence at the boundary. A control point flowchart followed which displayed the processes and information storage media which lead from the exchange data to the relevant accounts.

Case-Specific Data

Case-specific data were presented in the control point worksheet and program. The control point worksheet describes the controls over each process listed on the control point flowchart and the related compliance test over each control. It also lists the audit implications of any missing or ineffective controls and any audit procedures undertaken to deal with any of these deficiencies. An example is presented in reduced form in the Appendix. In the experiment, control risk over two processes was manipulated by forming combinations of *controls* which differed in strength and *compliance tests* which differed in strength. The affected processes were: (1) the manual preparation of purchase input forms from the voucher package and (2) running the computer program which updates the open accounts payable file and produces the weekly voucher report (noted P-5,A-6 and P-4,A-4, respectively, in the Appendix).

Experimental Design

Case-specific information in the control point worksheet and program relating to the two processes was systematically varied in a 4×4 experimental design to form 16 case versions. The *two factors* in the design were the *two processes* noted above. Processes P-5,A-6 and P-4,A-4 were chosen to represent processes of *high* and *low* susceptibility to error. The rationale for this choice was that, given the same dollar flow through the processes, the detailed manual processing of input data was likely to contribute greater error than the running of a routine computer program. (Recall that *process susceptibility* is the risk of generation of intolerable error assuming no controls are applied.) This judgment was consistent with those of the four pilot subjects and the oral debriefing of the experimental subjects.

The four control risk levels of each factor were different combinations of the *strength of the relevant controls* and the *strength of the compliance test* for the process and are presented in Table 1. Control P-4,A-4 (over the computer program—the low susceptibility process) involved the comparison of voucher numbers and dollar amounts, by account and in total, between the weekly voucher report and the purchase input form. Control P-5,A-6 (over preparation of input forms—the high susceptibility process) compared the number of vouchers and dollar amounts from the purchase input form to the log of vouchers prepared.

Identical changes were made in the controls and compliance tests for *both* processes to produce the four levels. The *stronger* version of each control involved its application to data from *all weeks* and performance of the control was documented. The stronger control was compliance tested by either (1) a detail test which involved noting the clerk's initials and agreeing the number of documents and relevant amounts for a sample of 30 items (the *stronger test*) or (2) inquiry and observation that the procedure had been properly performed (the *weaker test*). The two combinations produce the first and second levels of each factor (see Table 1).

The *weaker* version of each control was identical to the stronger version except that it was only applied to *one week* per month and was not documented. The weaker control also was combined with

TABLE 1
INDEPENDENT VARIABLE LEVELS

High Susceptibility Process (P-5, A-6) Prepare Purchase Input			
Stronger Control	The number and total dollar amount of all vouchers listed on the purchase input form are agreed to the log of vouchers prepared.		
		Detail Test	Select a sample of 30 purchase input forms. Note initials of accounting clerk #1. Agree total number of vouchers and total dollar amount of all vouchers to the log of vouchers prepared.
		I&O	Ascertain through inquiry and observation that this control procedure has been properly performed.
Weaker Control	For one week per month, the number and total dollar amount of all vouchers listed on the purchase input form are agreed to the log of vouchers prepared.		
		I&O & Scan	Ascertain through inquiry and observation that this control procedure has been properly performed. Scan the file of purchase input forms and voucher log for agreement of voucher numbers and amounts.
		I&O	Ascertain through inquiry and observation that this control procedure has been properly performed.
Low Susceptibility Process (P-4, A-4) Run Program			
Stronger Control	Voucher numbers and dollar amounts processed (per the weekly voucher report) are agreed to the voucher numbers and dollar amounts, by account distribution and in total, entered for processing (per the purchase input form).		
		Detail Test	Select a sample of 30 weekly voucher reports. Note initials of accounting clerk #2. Agree total number of vouchers and dollar amounts (by account distribution and in total) to the applicable purchase input form.
		I&O	Ascertain through inquiry and observation that this control procedure has been properly performed.
Weaker Control	For one week per month, voucher numbers and dollar amounts processed (per the weekly voucher report) are agreed to the voucher numbers and dollar amounts, by account distribution and in total, entered for processing (per the purchase input form).		
		I&O & Scan	Ascertain through inquiry and observation that this control procedure has been properly performed. Scan the files of weekly voucher numbers and dollar totals (by account distribution and in total).
		I&O	Ascertain through inquiry and observation that this control procedure has been properly performed.

two different compliance tests. Compliance tests for the weaker control involved either (1) ascertaining through inquiry and observation that the procedure had been performed properly and scanning the relevant documents for agreement in numbers and dollar totals (the *stronger test*) or (2) inquiry and observation alone (the *weaker test*). These two combinations form the third and fourth levels of each factor (see Table 1). In all cases, no compliance deviations were in evidence.

Note that the same manipulations were made to the controls and compliance tests over the more and less susceptible processes resulting in the four control risk levels for each of the two processes which are the factors in the experiment. However, *different* compliance tests were applied to the strong and the weak versions of the controls over the processes because detail compliance tests, which are the most common tests applied to the strong *documented* controls, cannot be

FIGURE 1
EXPERIMENTAL DESIGN

			Low Susceptibility Process (Run Program P-4, A-4)			
			Stronger Control (Documented)		*Weaker Control (Undocumented)*	
			Detail Test	*I & O*	*I & O and Scan*	*I & O*
High Susceptibility Process (Prepare Purchase Input P-5, A-6)	Stronger Control (Doc.)	Detail Test	/////////// /////////// ///////////			/////////// /////////// ///////////
		I & O		/////////// /////////// ///////////	/////////// /////////// ///////////	
	Weaker Control (Undoc.)	I & O and Scan		/////////// /////////// ///////////	/////////// /////////// ///////////	
		I & O	/////////// /////////// ///////////			/////////// /////////// ///////////

performed on the weak *nondocumented* controls (there is no detail to test). As a result, the experiment is a 4×4 design where the control risk of two processes is varied over four levels as opposed to a 2^4 design.[4] These specific combinations of controls and tests also allow certain comparisons to be made which have important audit planning implications. The description of the four control design strength/compliance test strength combinations for the two accounting processes employed in the design is presented in Table 1.

Taking all combinations of the four levels of the two factors (processes) produces the 16 case versions illustrated in Figure 1. The use of within-subjects (repeated measures) designs as a policy-capturing method is common in the decision-making literature (see Libby [1981] and Ashton [1982] for discussions of the strengths and weaknesses of this technique). Discussions with pilot subjects suggested that approximately eight case versions could be completed without inducing boredom. In prior studies, fractional blocks normally were formed by making one factor in the design a between-subjects factor (e.g., Libby [1979] and Wilkins and Zimmer [1983]). In the current study this could involve splitting the upper and lower halves of the cube presented in Figure 1. This approach dra-

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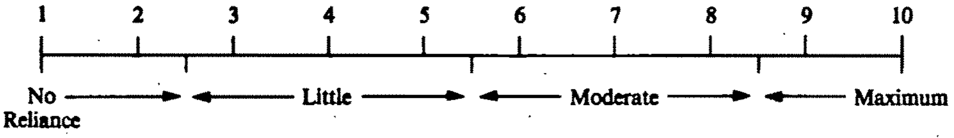
[4] An alternative approach would have involved manipulating the process susceptibility of a single process at two levels. This would have produced a 2×4 design and the suggested relationships would result in an interaction between control risk and process susceptibility. It was thought that the current approach which involved choosing accounting activities (processes) which naturally differed in process susceptibility was more realistic than this other alternative. Further, varying two processes as we did in combination with the complex design should make it more difficult to discover the researchers' hypotheses. While both approaches potentially confound other factors with susceptibility, the alternative may confound fewer other factors.

FIGURE 2
RESPONSE SCALE



matically decreases the degrees of freedom and the resulting power of any comparisons among the two halves of the design. It also does little to hide the nature of the experimenter's hypotheses which may result in experimental demand (where subjects behave in the manner in which they believe the experimenter wants). Of additional importance here is the possibility that the participants might develop a simple response set as all combinations of the 2×4 half of the design are present.

In many other studies, all subjects were presented with a fractional replicate of the design (e.g., Ashton [1974]). This would involve presenting all subjects with a one-half fractional replicate of the 4×4 design. However, this method is not appropriate in the case of a 4×4 design because it would result in confounding of the two main effects.

In place of this approach, a 4^2 factorial design confounded in blocks of eight units was employed [Cochran and Cox, 1957, pp. 188–192]. Blocks of eight cases were selected by forming the two one-half fractional replicates of the 4^2 design defining the partitioning by the $X(4)Y(4)$ (lower right-hand) cell. As a result, this component of the two-way interaction is confounded with blocks and one degree of freedom in that term is lost. The results of this design can be interpreted as a simple two-way ANOVA with the assumption that the $X(4)Y(4)$ component of the interaction is zero. The two blocks of eight correspond to the shaded and unshaded cells in Figure 1. The principal benefits of this design over the simpler design described above are that (1) the loss in power is spread more evenly over the design instead of applying only to one main effect, and (2) it is more difficult to develop a simple response set for either block as adjoining cells are less often included in the same block. Subjects were assigned randomly to one of the two blocks of cases. Cases were presented in a different random order for each subject.

Response Scale

For each case version, the participants were required to provide control reliance ratings on a ten-point scale. This scale is an expanded version of the four-point rating scale currently used in the firm's practice. The new scale was constructed by breaking down the current four categories (no, little, moderate, and maximum reliance) into ten categories as illustrated in Figure 2, which was also included in the instructions. The four-category scale is tied directly into the firm's substantive testing workpaper where it is input directly into a sampling routine (see Elliott [1983]). Each scale value then has a specific effect on the substantive sample size. The ten-point expansion is an experimental attempt to allow the auditors to make finer distinctions among internal control systems, while maintaining the tie to the actual scale used in practice. The choice of the ten-point scale over the four-point did not substantially affect the magnitude or direction of the discovered effects. In the debriefing, subjects indicated no difficulty in using the expanded scale.

Subjects

Fourteen auditors from 14 different offices of Peat, Marwick, Mitchell & Co. agreed to serve as subjects. Each subject was selected by the individual offices and was experienced in the evaluation of the internal control systems of manufacturers. Two auditors did not provide complete responses and were dropped from the analysis. The 12 subjects had spent an average of 10.1 years in public accounting (range of six to 14 years); five were partners, six were senior managers, and one was a manager. On average, it took 2.7 hours to complete the task.

RESULTS

Process Susceptibility and Control Risk

The behavior of interest can be analyzed through the terms of the 4×4 ANOVA design represented by the 16 cases and the related multiple comparisons and assessments of the magnitude of effects. Hypothesis 1 suggests that differences in control risk over a more susceptible process should have a greater effect on control reliance decisions than the same differences relating to a less susceptible process. This hypothesis suggests that differences in the levels (control-test combinations) of both factors (processes) in the ANOVA should produce significant main effects, but that the magnitude of the effect of the factor representing the high susceptibility process should be larger. Further, this relationship should hold true for each change in the level of the factors. The hypotheses do not suggest that the control risk of the two processes interacts so that a significant two-way interaction is not expected.

Table 2 presents the cell means and standard deviations and the summary ANOVA table. Both main effects are highly significant as suggested by the hypotheses. The two-way interaction is not significant. This suggests that the changes in control risk caused by differences in controls and compliance tests related to both processes had a significant effect on control reliance judgments. To test hypothesis 1, the magnitude of the main effects was assessed by computing omega-squared statistics [Hayes, 1981, pp. 365–366]. These statistics were .42 and .16, respectively, for the more susceptible and less susceptible processes. In total, the two main effects accounted for 58 percent of the variance. This implies that the changes relating to the more susceptible process had 2.6 times the effect of the *same* changes relating to the less susceptible process. These results are consistent with hypothesis 1.

The differences in the magnitudes of the effects can best be illustrated graphically by comparing the first column and first row of Table 2. The upper left-hand point in Figure 3 is the mean control reliance rating where each process is subject to the strongest control and test. Each line in Figure 3 represents the effect of each change in control and test strength on one process, holding the other process constant at its highest level. The greater slope of the line relating to the more susceptible process illustrates the larger impact of the changes relating to the more susceptible process. The same relationship holds if we graph the other levels of the two factors (e.g., comparisons of the second row with the second column, etc.).

Multiple comparisons among the row and column means provide direct evidence concerning hypotheses 2 and 3 as well as the relative strength of different compliance testing strategies. Table 3 presents these comparisons based on the

TABLE 2
ANOVA
CELL MEANS AND STANDARD DEVIATIONS

			Low Susceptibility Process (Run Program P-4, A-4)				
			Stronger Control (Documented)		*Weaker Control (Undocumented)*		
			Detail Test	*I & O*	*I & O and Scan*	*I & O*	
High Susceptibility Process (Prepare Purchase Input P-5, A-6)	Stronger Control (Doc.)	Detail Test	9.83 (.41)	8.33 (1.37)	7.33 (1.51)	7.17 (2.23)	8.17
		I & O	8.00 (1.67)	7.67 (1.37)	6.50 (1.64)	5.00 (1.10)	6.79
	Weaker Control (Undoc.)	I & O and Scan	6.83 (2.56)	5.83 (1.33)	4.83 (1.17)	4.00 (1.55)	5.38
		I & O	5.17 (1.84)	4.00 (1.90)	3.67 (2.25)	3.50 (1.05)	4.08
			7.46	6.46	5.58	4.92	6.10

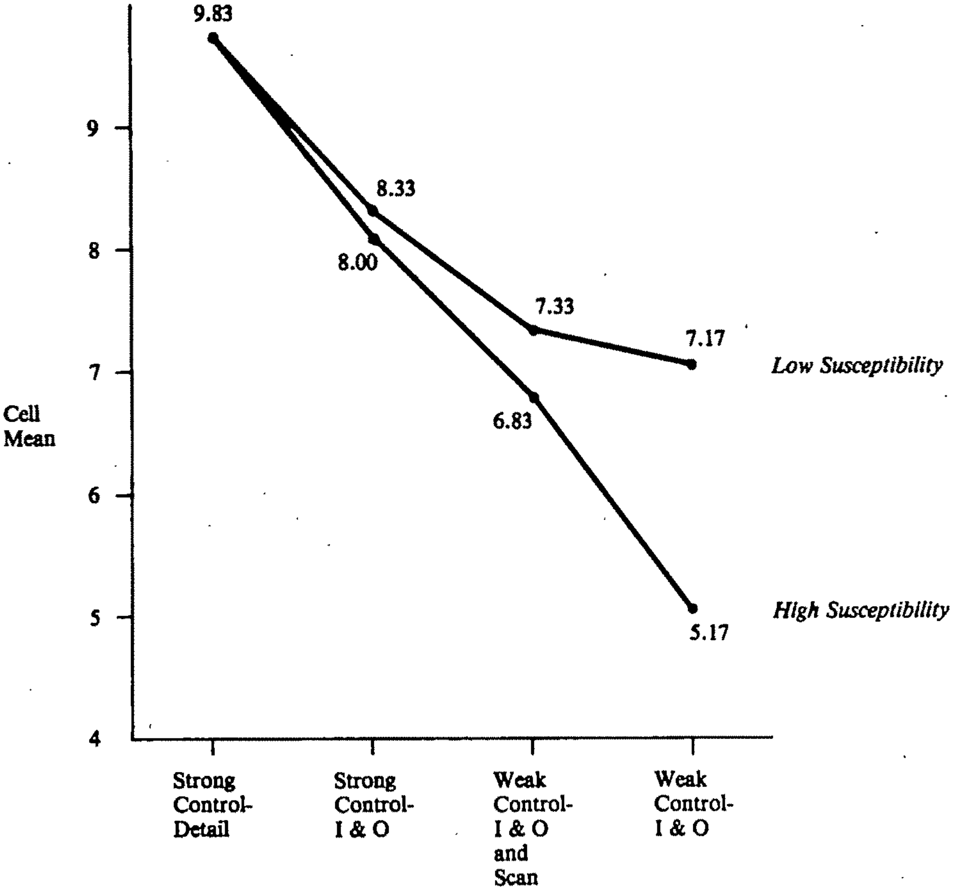
ANOVA TABLE*

Source	*SS*	*df*	*MS*	*F*	*Prob.*
Treatments					
Main Effects					
High Susceptibility	224.21	3	74.74	39.25	<.001
Low Susceptibility	87.38	3	29.13	15.30	<.001
Interaction (High × Low)	5.87	8	.73	.38	>.5
Replications	58.96	5	11.79	6.19	<.001
Blocks W/in Repl.	27.25	6	4.54	2.39	<.05
Error	133.28	70	1.90		
Total	536.95	95			

* The replications factor indicates the variance attributed to differences among the six replications (pairs of subjects). The blocks within replications factor indicates the variance attributed to assigning individuals to blocks within replications. Taken together, these two effects are equivalent to the "subjects" effect in a more traditional repeated measures design.

Newman-Keuls procedure [see Winer, 1971, pp. 528, 529]. All differences among the row means which relate to the more susceptible process are greater than the corresponding differences among the column means which relate to the less susceptible process. In fact, all the differences relating to the more susceptible process are significant at the .01 level, while for the less susceptible process, two of the differences are significant at only the .05 level and one is not significant at even the

FIGURE 3
COMPARISON OF MAGNITUDE OF EFFECTS



.1 level. This again is consistent with our hypotheses.

Control design strength. Referring to Table 2, comparisons between the second and fourth rows and the second and fourth columns of the design are most relevant to hypothesis 2. These differences represent the effect of decreasing the *control strength* holding the test constant at inquiry and observation. The difference in control reliance rating caused by the change in control strength is 2.71 for the more susceptible process and, as predicted, is less (only 1.54) for the less susceptible process (see Table 3). This suggests that the effect of changes in control strength is contingent on the susceptibility of the process being controlled, and supports hypothesis 2.

Test strength. Comparisons between the first and second columns and the first and second rows, and between the third and fourth columns and the third and fourth rows of Table 2, are most relevant to hypothesis 3. These differences portray the effect of decreasing the *test strength,* holding the control strength constant.

Comparing the first and second columns with the first and second rows demonstrates the effect of changing from a

TABLE 3

NEWMAN-KEULS PAIRED COMPARISONS—DIFFERENCES BETWEEN TREATMENT MEANS

HIGH SUSCEPTIBILITY (Prepare Purchase Input)

Mean	*8.17*	*6.79*	*5.38*	*4.08*
Levels	*1*	*2*	*3*	*4*
2	1.38***			
3	2.79***	1.41***		
4	4.09***	2.71***	1.30***	

LOW SUSCEPTIBILITY (Run Program)

Mean	*7.46*	*6.46*	*5.58*	*4.92*
Levels	*1*	*2*	*3*	*4*
2	1.00**			
3	1.88***	.88**		
4	2.54***	1.54***	.66	

Table values are the differences between treatment means

* = $p \leq .1$
** = $p \leq .05$
*** = $p \leq .01$

compliance test of details (a stronger test) to an inquiry and observation test (a weaker test), holding control strength constant at the stronger level. The difference in control reliance rating caused by the change in test strength is 1.38 for the more susceptible process and 1.00 for the less susceptible process. This result is consistent with hypothesis 3. Comparing the third and fourth columns with the third and fourth rows of Table 2 compares the effects of changing from an inquiry and observation test combined with a scan of the related files (a stronger test) to an inquiry and observation alone (a weaker test), holding control strength constant at the weaker level. The difference in control reliance rating caused by the change in test strength is 1.30 for the more susceptible process and only .66 for the less susceptible process. These findings again are consistent with hypothesis 3. The effects of changes in test strength related to a more susceptible process resulted in a greater change in control reliance than the same change over a less susceptible process.

Consensus

Following prior studies, consensus among the auditors' control reliance ratings was assessed by computing all pairwise correlations among the auditors' assessments. For the two blocks of eight cases, the mean correlations were .64 and .72. Also, the standard deviations of the responses to each case are reported in Table 2.

DISCUSSION

Internal Control and Audit Risk

Given the complexity of the relationships involved, it is refreshing that the auditor subjects' performance so closely matched the predictions developed from the audit risk model. The results suggest that auditors act as if they consider the contingent nature of the effects of process susceptibility and control risk when determining the extent of substantive testing. Responses to changes in the strength of controls and the more subtle effect of the strength of the compliance tests depended on the susceptibility of the accounting process being controlled. These results are in contrast to the simplistic decision rules discovered in much of the psychological literature. However, Ashton [1982] and Libby [1981] cite a number of accounting studies where heuristic use is less in evidence than in similar psychology studies.

Although they cannot be evaluated directly from the data, a number of possible explanations for the high level of performance are available. The first relates to the structured approach to internal control evaluation taken by the firm. The documentation technique which juxtaposes the process, the control, and the test may substantially ease the process of considering the interaction of the susceptibility of each process with control and test strength. Second, although findings concerning the effects of experience on audit judgment quality are inconsistent, the subjects in this experiment were more experienced than most and were selected as having expertise in the evaluation of internal controls. Less experienced subjects may perform differently.

Compliance Testing Strategies

Even on a simple audit, planning the optimal degree of reliance on internal controls and substantive testing is a complex problem. The costs of all of the alternative combinations must be weighed against the degree of assurance which is provided. Most relevant to the current study is the degree to which one should compliance test different controls. Auditing standards require that all controls that are relied upon be compliance tested, the degree of testing being a function of the *planned reliance* on the controls. Further, the same degree of testing does not have to be applied to each control to produce the planned level of reliance.

In fact, given that different processes in a processing stream are differentially susceptible to error, it is likely that applying equally strong (and costly) tests to each control will be inefficient. The audit risk model implies that applying stronger tests to the more susceptible processes should produce a greater increase in reliance than increasing test strength by the same amount related to a less susceptible one. As discussed above, subject performance was consistent with this notion.

The results of the current study suggest the degree to which planned reliance depends on the strength of the tests of both documented and undocumented controls. Our results suggest that the auditor assesses a significant reliance penalty if cheaper inquiry and observation tests are applied to even a single *documented* control (1.38 for the more susceptible process). This suggests that auditors believe there is a large difference between the strength of detail tests and inquiry and observation.

When faced with a small number of partially effective, undocumented controls, auditors may believe that they have no choice but to place little reliance on the control system because they do not have the opportunity to apply traditional tests of details to the controls. However, our results suggest that, even in these cases, reliance can be increased by applying additional, less formal procedures, often referred to as scanning.

Consensus

Consensus among auditors' internal control evaluations and the related audit planning decisions has been the focus of many prior studies. Most of those that examined audit planning decisions used Joyce's measure, the number of audit hours planned, as the dependent variable. When consensus was measured using a correlation measure, reported mean results varied from .37 to .62, compared to .68 in the current study. However, in all of the studies the group variability in responses to individual cases was quite high. For example, Gaumnitz, et al. [1982] report coefficients of variation for individual cases ranging from .65 to .94. Although they are not directly comparable, only one of our cases had a coefficient of variation more than .3. Since the control reliance ratings are directly convertible into sample sizes, the possibility exists that the variation among auditors may have been reduced by the new technology. Definitive findings on this issue must await further study.

Limitations

Although every attempt was made to ensure the realism of the case study materials and the dependent variable, numerous questions of external validity remain. First, the realism of the case studies required that the study's participants be selected from the firm whose audit approach was mimicked in the cases. Further, although wide geographic representation was obtained, the small sample size further limits generalizability.

Also, the conditions under which the cases were evaluated were probably simpler than those faced in a normal audit. The documentation provided was very complete and the participants faced little in the way of time pressure. On an actual audit, the auditor must evaluate the processes and controls relating to a wide variety of financial statement assertions as opposed to a series of cases dealing with the same assertion. In response to these increases in pressure and cognitive load, simpler strategies than those revealed may be relied upon. Also, the case materials themselves were limited in their scope of application to a common cycle in a common type of client. Less familiar circumstances may also produce different results. These possibilities can only be evaluated in future research.

APPENDIX I
CASE VERSION EXAMPLE

BETTER BEVERAGE CO.
CONTROL POINT WORKSHEET AND PROGRAM
PURCHASING/DISBURSEMENT CYCLE
12/31/X3

Case No. 1

Section I—Identified Processing Controls

Control Identifier	*Control Description*	*Person/Dept. Performing Control*	*Performance of Control Documented?* Yes	No	*How & Where?*	*Would Control be Effective If Properly Performed?* Yes	No	*Will Control be Compliance Tested?* Yes	No	*Compliance Tests: Audit Procedures*
P-1	Journal entries are standardized; monthly summaries of entries prepared by the general ledger accountant are reviewed to ensure that all standard entries have been made.	Controller	X		Initials on summaries	X		X		Note controller's initials on each monthly summary and note that entries were posted each month in the general ledger for purchases and disbursements.
P-2, A-1	Voucher numbers and dollar amounts processed (per the edit report) are agreed to the number of vouchers and voucher amounts, by account distribution and in total, entered for processing (per the purchase input form).	Acctg. clerk #2	X		Initials on edit report	X		X		Select a sample of 30 edit reports. Note initials of accounting clerk #2. Agree total number of vouchers and dollar amounts (by account distribution and in total) processed to the applicable purchase input form.
P-3	Checks generated are counted and agreed to the total number of checks per the check register.	Controller's secretary	X		Initials on check register	X		X		Select a sample of 30 check registers. Note initials of controller's secretary and note that listed checks were paid by the bank or are listed as outstanding.
A-2	Checks are compared to supporting documentation contained in the voucher package.	Controller	X		Signature on check	X		X		Select a sample of 30 checks. Note manual signature of controller, agree amount to the related voucher, and note completeness and approval of voucher package documents.
A-3	The dollar total of checks mailed to vendors (per the mail clerk's adding machine tape) is agreed to the dollar total of the check register.	Mail clerk	X		Initials on check register	X		X		Select a sample of 30 check registers. Note initials of mail clerk and agree dollar total to the applicable adding machine tape.
P-4, A-4	Voucher numbers and dollar amounts processed (per the weekly voucher report) are agreed to the voucher numbers and dollar amounts, by account distribution and in total, entered for processing (per the purchase input form).	Acctg. clerk #2	X		Initials on weekly voucher report	X		X		Select a sample of 30 weekly voucher reports. Note initials of accounting clerk #2. Agree total number of vouchers and dollar amounts (by account distribution and in total) to the applicable purchase input form.
A-5	Keypunched data are keyverified.	Keypunch clerk		X	N/A	X			X	None necessary—A-1 and A-4 test for accuracy at this control point.
P-5, A-6	The number and total dollar amount of all vouchers listed on the purchase input form are agreed to the log of vouchers prepared.	Acctg. clerk #1	X		Initials on purchase input form	X		X		Select a sample of 30 purchase input forms. Note initials of accounting clerk #1. Agree total number of vouchers and total dollar amount of all vouchers to the log of vouchers prepared.
R-1	The general ledger balance of accounts payable is reconciled monthly to the subsidiary ledger. Any differences are investigated and adjusted.	Acctg. supervisor	X		Reconciliation form	X		X		Review each monthly reconciliation form, noting adjustment of any differences.

APPENDIX I *(Continued)*

Section II—Missing/Ineffective Processing Controls

Identifier	Missing Control Type P	Missing Control Type A	Missing Control Type R	Audit Implications of Missing/Ineffective Controls	Audit Procedures
MC-1		X		No controls to ensure dollar accuracy of journal entries.	Agree journal entry amounts from general ledger to totals of the weekly edit reports and check registers for each month.
MC-2	X			No population controls to ensure proper entry of data from purchase input form to punched cards. This situation is effectively mitigated by controls P-2 and A-1.	None necessary.
MC-3	X	X		No population or accuracy controls to ensure the propriety of subsidiary ledger data. However, subsidiary ledger errors are detected and corrected by control R-1.	None necessary.

DEGREE OF RELIANCE RATINGS (SEE INSTRUCTIONS)

1. Enter "maximum," "moderate," "little" or "none." ____________
2. Enter any number from one (no reliance) to ten (maximum reliance). ____________

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THE ACCOUNTING REVIEW
Vol. LX, No. 2
April 1985

An International Study of Accounting Practices in Divisionalized Companies and Their Associations with Organizational Variables

Robert W. Scapens and J. Timothy Sale

ABSTRACT: The measurement of divisional performance is still a subject of some debate. Most accounting researchers appear to favor measures which either include an interest charge on capital employed or relate divisional income to its capital asset base, but some dissenters exist. Various measures are used in practice. The use of particular accounting methods is hypothesized to be influenced by organizational characteristics, such as the extent to which decision making authority has been delegated to divisional managers.

An empirical study of associations between 12 variables reflecting accounting methods and the nature of divisional autonomy was undertaken from questionnaire surveys of large companies in the United States (U.S.) and the United Kingdom (U.K.), and the relationship between accounting methods and the nature of divisional autonomy in the two countries is examined.

Many similarities were observed in the accounting methods used by the responding companies in the U.S. and the U.K. to evaluate divisional performance, analyze divisional capital expenditure proposals, and control authorized divisional capital expenditures. The major difference between the countries was the use of post-completion audits by more than twice as many U.S. companies (84.2 percent) as U.K. companies (36.3 percent).

In both countries, the expected associations between accounting methods and divisional autonomy were not found. Further research is needed to explore the dynamics of accounting systems in divisionalized companies, such as longitudinal studies of individual companies.

THE appropriate measurement of divisional performance has been a concern of accountants in recent years. Many accounting researchers have favored measures which include an interest charge on capital employed [Solomons, 1965] or at least on some part thereof [Tomkins, 1973]. Others have supported the use of return on investment (e.g., Shillinglaw [1977]). A review of the debate concerning appropriate measures led Emmanuel and Otley [1976] to conclude that there is a measure of agreement; income should be related to capital

The authors are grateful to Pantelis Tikkas for assistance in collecting the U.K. data, to Pat Thomson for implementing the Guttman-Lingoes Nonparametric programs, and to Murray Bryant, David Cooper, and David Otley for commenting on earlier drafts of this paper. Any remaining errors or omissions, however, are the responsibility of the authors.

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Manuscript received November 1983.
Revision received May 1984.
Accepted September 1984.

employed when assessing divisional performance. Amey [1969 and 1975], however, argued that investment decisions should be reserved for corporate management and the capital asset base need not be introduced into the assessment of divisional operating performance.

Surveys in the United States (U.S.) [Mauriel and Anthony, 1966; Reece and Cool, 1978] and in the United Kingdom (U.K.) [Tomkins, 1973; Scapens, Sale and Tikkas, 1982] indicate that various measures are used in practice. Some companies use measures which reflect divisional capital employed either through an interest charge or by relating income to the capital asset base. Other companies use measures such as cash flow and income before interest and taxes, which do not reflect fully the cost of divisional capital investment.

This paper describes the relationship between accounting practices in divisionalized companies and certain organizational variables. The data were collected in 1980 from a mail survey of companies in the *Fortune* 500 in the U.S. and the *Times* 1000 in the U.K. Two countries were studied in an attempt to explore international differences in accounting methods.

Particular attention was given to the measurement of divisional performance and the control of divisional capital investment in the questionnaire. In addition, questions were asked about the nature of the organization and its divisionalized structure. The questionnaire survey was undertaken primarily to obtain data about the accounting methods used in practice. A subset of the questionnaire data will be used to test hypotheses that organizational variables, in particular the extent of divisional autonomy, contribute to the diversity of accounting methods used in divisionalized companies.

DIVISIONAL PERFORMANCE MEASUREMENT

The debate concerning divisional performance measurement has been primarily normative. There is little theoretical or empirical work which attempts to explain the diversity of divisional performance measures observed in practice. As a result, the present study is exploratory. The existing literature, however, provided the background for the hypotheses which were developed. Accordingly, the paper begins by reviewing briefly some normative arguments concerning performance measurement in divisionalized companies.

Divisional managers are aware that their performance will be measured at some later date and that financial and/or non-financial rewards may be obtained if appropriate decisions are made. In this way, performance measurement has the potential to influence decisions. Ideally, performance would be measured and rewarded directly by reference to the decision outcome—e.g., the achievement of the goals which corporate management has set for the division. One difficulty is that a division's goals may be expressed in long-run terms, whereas performance measures are prepared on a periodic (short-run) basis. For periodic reporting to be effective, the performance measure must reinforce the divisional goals.

Periodic performance measures which do not reinforce divisional goals could introduce bias into decision making. Consider a divisional manager who has authority to make decisions regarding expenditures on fixed assets and/or working capital. Performance measures which do not reflect the capital asset base of the division could encourage the divisional manager to make capital investments below the cost of capital. Measures not incorporating the capital asset base may be used, however, because divisional managers do not have the authority to make capital investment decisions (including decisions which affect the level of working capital) or alternatively, because control over such decisions is exercised in some other way, for instance, through a process of authorization, reinforced by *ex post* audits of capital projects [Scapens and Sale, 1981a].

This suggests that divisional performance measurement may be influenced by the extent of delegated authority over capital investment decisions (including operating decisions which affect investment in working capital) and by the use of alternative methods for the control of divisional capital investment decisions. It is possible, however, that the methods of controlling divisional decisions and measuring divisional performance will themselves influence the extent of delegated authority [Otley, 1980]. Accordingly, the causal relationships could be very complex. The issue addressed here, therefore, is the association (rather than causal relationship) between accounting methods and the extent of delegated authority.

It should be recognized that notions such as delegation of authority and divisional autonomy cannot be interpreted in any absolute sense. Since corporate management wants to retain control over the direction of the organization as a whole, some restrictions must be imposed on the actions taken by divisional managers. The nature of these restrictions will give more or less autonomy to divisional managers.

Divisional performance measures may or may not include an explicit adjustment for divisional capital employed. Such an adjustment could either be made through an interest charge on capital employed or reflected in a return on investment ratio. We are concerned with the association between the use of any accounting method which includes an explicit adjustment for divisional capital employed and the extent of divisional autonomy.

THE QUESTIONNAIRE SURVEY

The data for this paper were collected as part of a wider study of accounting in divisionalized companies. Identical questionnaires were used in both the U.S. and U.K. except for minor amendments for slight differences in terminology and monetary amounts.[1]

The U.K. questionnaires were mailed to the 744 companies in the *Times* 1000 which are not subsidiaries of overseas corporations. Ten questionnaires were undelivered because the company had liquidated or merged, giving a reduced sample size of 734. Replies were received from 331 U.K. companies (a response rate of 45.1 percent), of which 300 were usable (a usable response rate of 40.9 percent). The unusable responses were from 31 companies who sent a letter indicating their unwillingness to complete the questionnaire due to company policy or lack of time.

The U.S. questionnaires were mailed to all companies in the *Fortune* 500. Four questionnaires were returned undelivered and three companies had been acquired by other companies, giving a reduced sample size of 493. Replies were received from 243 U.S. companies (a response rate of 49.3 percent), of which 227 were usable (a usable response rate of 46.0 percent). The unusable responses were from 16 companies who sent a letter indicating their unwillingness to complete the questionnaire due to company policy or lack of time.

The representativeness of the respondents was confirmed by comparing the total sales, reported net income, and principal activities of the responding companies with the characteristics of the population.

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[1] Copies of both the U.S. and U.K. questionnaires are available upon request from either author.

Not all of the responding companies had a divisional structure. The analyses described in this paper are based on the replies from 211 U.K. and 205 U.S. companies which are divisionalized according to the following definition of a division: "A section within the organization where the divisional chief executive has responsibility for costs, revenues, and at least some discretion over capital expenditures (e.g., working capital management, capital projects up to a specified sum, etc.)." This definition is a synthesis of definitions discussed in Solomons [1965] and Tomkins [1973]—see Scapens, Sale and Tikkas [1982, pp. 20–21].

The questionnaires were addressed to the corporate headquarters with instructions that they should be completed by "corporate accounting personnel." Thus, the responses inevitably reflect only the formal systems within the organization. In general, these formal systems apply to all or most divisions within a particular organization. The replies to questions concerning differences in the treatment of individual divisions indicate that standard systems are used with few, if any, exceptions.

A series of interviews with corporate controllers in the U.K. and the U.S. was undertaken prior to the survey. These interviews assisted in the development of the questionnaire. In addition, post-questionnaire interviews were used to test the reliability of the responses. Tests for non-response and question-order bias were also performed.

The test for non-response bias of Moser and Kalton [1971, pp. 185–186] was performed by analyzing differences in replies received from the first questionnaire mailing and the follow-up letter. The absence of significant differences indicates that replies were unaffected by the timing of the response. To avoid question-order bias, two versions of the questionnaire were used—each version contained identical questions, but ordered differently. Chi-square tests (corrected for non-continuity) were unable to locate evidence of question-order bias. In general, the non-response and question-order bias tests indicate that the questionnaire data provide a satisfactory database concerning large divisionalized companies in the U.S. and the U.K.

ACCOUNTING PRACTICES

The questionnaire asked respondents to supply factual information about practices in their companies. Thirty-nine questions were included in the questionnaire soliciting various types of information from each company, such as total annual capital expenditures, annual sales and profits, bases for divisionalization, interdependencies between divisions, the length of time divisionalized, the criteria used to evaluate the performance of divisional managers, the responsibility of divisional managers for operating and capital expenditures budgets, and the use of post-completion audits of capital investment projects (see Scapens, Sale and Tikkas [1982] for details of the questionnaire).

The financial criteria used to evaluate the performance of divisional managers in the companies responding to the questionnaire are shown in Table 1. A majority of the companies in both the U.S. and the U.K. use a performance measure which reflects divisional capital employed (either through a rate of return or an interest charge). There is, however, a sizable minority not using such performance measures.

Two additional accounting methods will be examined in this paper: discounted cash flow (DCF) analysis of divisional

TABLE 1

FINANCIAL CRITERIA USED TO EVALUATE THE PERFORMANCE OF DIVISIONAL MANAGERS

	U.S.		U.K.	
	No.	*Percent**	*No.*	*Percent**
1. Achievement of a target rate of return imposed by the corporation	106	51.7	92	44.7
2. Achievement of a target profit after charging interest on total capital employed by the division	59	28.8	77	37.4
3. Achievement of a target profit before interest and taxes	93	45.4	104	50.5
4. Achievement of a target cash flow figure	44	21.5	86	41.7
5. Ability to stay within budget	101	49.3	90	43.7
6. Other	42	20.5	18	8.7
Total Responses	205		206	
No Answer	0		5	
	205		211	

* Percentage of respondents (excluding no answers) using each criterion—multiple responses were permitted.

capital expenditure proposals and *ex post* (or post-completion) audits of capital projects. Table 2 summarizes the financial analysis techniques generally used in the responding companies to evaluate divisional capital projects involving an expansion of existing production facilities. Projects involving expansion were specifically mentioned in the question since financial analysis techniques are particularly appropriate for such projects.

Table 3 describes the procedures used by responding companies to control the implementation of divisional capital expenditure decisions. Differences in practices in the U.S. and the U.K. can be seen in both Table 2 and Table 3. The major difference between the U.S. and U.K. companies is that 84.2 percent of U.S. companies use post-completion audits as opposed to 36.3 percent of U.K. companies. Also, very few U.S. companies (6.9 percent) use "other" procedures to control the implementation of divisional capital expenditure decisions, while 23.9 percent of U.K. companies use "other" procedures. The majority of these U.K. companies indicated that they use informal rather than formal procedures. These informal procedures consist of monitoring the original capital authorization requests either prior to or after they are submitted to corporate headquarters by the divisions and then informally comparing the actual outcomes with the expected outcomes.

The following analysis will attempt to determine whether the use of DCF techniques and *ex post* audits is related to the extent of divisional autonomy.

VARIABLE CONSTRUCTION

A subset of the questionnaire data was used to construct the 12 variables listed in Table 4. These variables reflect accounting methods and divisional autonomy. The interconnectedness variables were included because a division's autonomy will

Table 2
Financial Analysis Techniques Used for Investment Appraisal

	U.S.		U.K.	
	No.	Percent*	No.	Percent*
1. Discounted cash flow (NPV or IRR)	172	84.3	106	51.7
2. Payback	115	56.4	113	55.1
3. Accounting rate of return	83	40.7	114	55.6
4. Non-financial criteria used	47	23.0	49	23.9
Total responses	204		205	
No answer	1		6	
	205		211	

* Percentage of respondents (excluding no answers) using each criterion—multiple responses were permitted.

be restricted to the extent that it depends upon other sections of the organization. For instance, a division which returns all of its cash flows to corporate headquarters, uses many central services, and is affected by the decisions made in other divisions would be believed, *a priori,* to have little autonomy.

The respondents were not asked to assess explicitly the autonomy of divisional managers. Responses to questions concerning decision making and other procedures were converted into an assessment of divisional autonomy through the variable construction described below. This approach avoids the bias which might be introduced from respondents interpreting the nature of autonomy differently. The scales developed have no established theoretical basis, but are consistent across all of the data, both in the U.S. and the U.K. data. Scales for the divisional autonomy variables, 1 through 9, were constructed such that a low value indicates decentralization, while a high value indicates centralization in the area in question.

Responses to a question concerning the nature of interdependencies between divisions were used to construct the scales for the first three variables. The particular interdependencies included in the question were suggested by the pre-questionnaire interviews. Interdependencies (variable 1, INTERDEP) and centralization of functions (variable 2, CENTFNC) were both scaled 0 through 5. These scales were obtained by counting the number of interdependencies between divisions and the number of centralized functions provided by corporate headquarters. Values of 0 were assigned to respondents who indicated no interdependencies or centralized functions. Centralized functions which are included in other variables were omitted from CENTFNC.

Cash returns to headquarters (variable 3, CASHRTN) is a dichotomous variable indicating whether divisions do (1) or do not (0) return cash to corporate headquarters.

The scale for the responsibility for operating budgets (variable 4, BUDGET) was constructed using responses to a question which asked: "Are divisional managers responsible for determining operating budget methods (i.e., techniques to be used) and gathering the necessary

TABLE 3

CONTROL OF AUTHORIZED CAPITAL PROJECTS

	U.S.		U.K.	
	No.	*Percent**	*No.*	*Percent**
1. Projects monitored through project accounts	115	56.9	110	54.7
2. Post-completion audits undertaken	170	84.2	73	36.3
3. Other	14	6.9	48	23.9
Total responses	202		201	
No answer	3		10	
	205		211	

* Percentage of respondents (excluding no answers) using each criterion—multiple responses were permitted.

information?" The following values were assigned to the responses:

0—divisional managers responsible for both determining operating budget methods and gathering the necessary information,
1—divisional managers responsible for information gathering, but budgeting methods determined centrally, and
2—both operating budget methods and information gathering centrally determined.

The scale for the responsibility for purchases (variable 5, PURCH) was based on the responses to a question concerning the extent to which divisional managers can approve large purchase contracts. With a range of 0 through 4, a value of 0 indicates complete autonomy and 4 indicates no autonomy in this area. The scale for the responsibility for sales/selling prices (variable 6, SELLPR) was constructed in a similar manner using responses to a question concerning the extent to which divisional managers are allowed to change prices of existing products or establish prices for new products. A value of 0 indicates delegation of complete authority for selling prices and 2 indicates corporate responsibility for selling prices. Both PURCH and SELLPR relate to external transactions; the responsibility for pricing internal transactions was dealt with separately in the questionnaire.

Authority for raising new financing (variable 7, NEWFIN) is a dichotomous variable indicating whether divisional managers are (0) or are not (1) allowed to raise external financing. The scale for authority over capital investment projects (variable 8, CAPEXP) ranges from 0 to 3, with the lower value indicating substantial autonomy and the higher value indicating little autonomy. Responsibility for capital budgets (variable 9, CAPBUD) indicates the extent to which divisional managers have responsibility for the preparation of capital expenditure budgets. A value of 0 indicates that the responsibility is at the divisional level, 1 indicates that there is interaction between the divisions and corporate headquarters, and 2 indicates that the responsibility is at the corporate level.

Two of the three accounting variables, PERFEVAL and INVAPP, are dichotomous variables. Although Tables 1 and 2

TABLE 4
VARIABLE LIST

Variable Group	*Variable No.*	*Variable Name*	*Variable Description*	*Scale*
Interconnectedness	1	INTERDEP	Interdependencies between divisions	0, 1, 2, 3, 4, 5
	2	CENTFNC	Centralization of functions	0, 1, 2, 3, 4, 5
	3	CASHRTN	Extent of cash returns to corporate headquarters	0, 1
Operating Autonomy	4	BUDGET	Delegation of responsibility for operating budgets	0, 1, 2
	5	PURCH	Delegation of responsibility for purchases	0, 1, 2, 3, 4
	6	SELLPR	Delegation of responsibility over sales/selling prices	0, 1, 2
Capital Expenditures Autonomy	7	NEWFIN	Delegation of authority to raise new financing	0, 1
	8	CAPEXP	Delegation of authority over capital investment projects	0, 1, 2, 3
	9	CAPBUD	Delegation of responsibility for capital budgets	0, 1, 2
Accounting Methods	10	PERFEVAL	Use of residual income/return on investment for divisional performance evaluation	0, 1
	11	INVAPP	Use of discounting techniques for investment evaluation	0, 1
	12	EXPOST	Use of accounting methods for ex post control of capital projects	0, 1, 2

indicate that a variety of accounting methods are used in both the U.S. and the U.K. and that multiple methods are common, the present analysis is restricted to the use or non-use of performance measures which reflect the capital asset base and discounted cash flow techniques. Variable 10, PERFEVAL, has a value of 0 when corporate headquarters does and 1 when corporate headquarters does not use return on investment and/or residual income to evaluate the performance of divisional managers. Variable 11, INVAPP, indicates whether corporate headquarters does (0) or does not (1) use discounted cash flow techniques in the formal evaluation of divisional capital expenditure proposals which involve an expansion of existing production facilities.

The *ex post* control of capital projects (variable 12, EXPOST) was constructed from a question which asked respondents to indicate the control mechanisms used to monitor the progress of authorized divisional capital projects. A value of 2 indicates that no *ex post* control mechanisms are used, 1 indicates that capital expenditures are monitored through project accounts, and 0 indicates that *ex post* control is exercised through independent evaluation and review, i.e., post-completion audits. This scale for EXPOST implies a rank ordering of project accounts and post-completion audits. It is assumed that the use of project accounts provides only partial *ex post* control over capital investments, primarily monitoring the disbursement for capital expenditures. Post-completion audits, however, are assumed to involve somewhat greater control through the (independent) evaluation of the outcomes of capital projects against the original capital authorization requests. Although a sizable minority of the U.K. companies studied use neither project accounts nor post-completion audits, such a scale was needed because all of the U.S. companies use at least one of these two control techniques. A dichotomy similar to those used for PERFEVAL or INVAPP would have been inappropriate for EXPOST as far as the U.S. data are concerned. A revised scaling of the U.K. EXPOST variable—a value of 1 indicating that neither project accounts nor post-completion audits are used and 0 indicating that at least one of these control techniques is used—did not significantly alter the U.K. statistics discussed below.

Since each of the 12 variables can take an explicit value of 0, the value 9 was used to identify missing values in each case.

It has to be admitted that the scales for all 12 variables are *ad hoc,* and alternative scales could have been used. Furthermore, there could also be problems created by overlap in the characteristics measured by particular variables. For example, the groups of variables representing operating and capital expenditure autonomy are unlikely to be independent of each other and of the interconnectedness group of variables. Yet, the scales should capture the essence of any associations between the accounting methods and the organizational variables included in the study. The results of the analysis must, however, be interpreted cautiously.

HYPOTHESES

The variables within each of the first three groups represent particular dimensions of the aspect of autonomy which the group is intended to reflect. There may be considerable overlap, however, in these dimensions [Ezzamel and Hilton, 1980], and thus, redundancy in the data may exist. This is necessary to ensure the covergent validity of the selected variables—i.e., that they capture the intended underlying factors of interconnectedness, operating autonomy, and capital expenditure autonomy. The following hypothesis will be tested.

Hypothesis H_1:

> The variables within each of the three groups of divisional autonomy variables, individually and collectively, reflect an underlying factor; viz.,
>
> a: interconnectedness (variables 1, 2, 3)
> b: operating autonomy (variables 4, 5, 6)
> c: capital expenditure autonomy (variables 7, 8, 9)

The interconnectedness variables were included in the study because divisional autonomy will be restricted by the extent to which divisions depend upon corporate headquarters and other divisions. Thus, positive associations are expected between the interconnectedness variables and the groups of variables representing operating and capital expenditure autonomy.

Hypothesis H_2:

> The extent of divisional operating autonomy and capital expenditure autonomy are associated with the interconnectedness of divisions.

Since some divisional operating autonomy is necessary for the delegation of capital expenditure decisions, a positive association is expected between operating autonomy and capital expenditure autonomy.

Hypothesis H_3:

> The extent of divisional capital expenditure autonomy is associated with the extent of divisional operating autonomy.

It was suggested earlier that accounting methods may be influenced by the extent of divisional autonomy. In particular, divisional autonomy may influence the use or non-use of performance measures which include an explicit adjustment for capital employed. Accordingly, positive associations are expected between PERFEVAL and each of the variables which reflect capital expenditure autonomy (NEWFIN, CAPEXP, and CAPBUD) and operating autonomy (BUDGET, PURCH, and SELLPR).

The interconnectedness of sections of the organization is also likely to influence accounting methods. A highly interconnected organization will require considerable central direction and will have little need for accounting methods designed to control autonomous divisions. Thus, positive associations are also expected between PERFEVAL and the variables which reflect interconnectedness, INTERDEP, CENTFNC, and CASHRTN. The following hypothesis summarizes the expected associations involving PERFEVAL:

Hypothesis H_4:

> The use of performance measures which include an explicit adjustment for capital employed is associated with the extent of divisional autonomy, as reflected by the interconnectedness, operating autonomy, and capital expenditure autonomy variables.

While it may be expected that the use of discounted cash flow techniques for the evaluation of divisional capital expenditures will be influenced by the extent of divisional autonomy, the direction of such influence is not clear. As a tentative hypothesis, it is suggested that there will be a positive association between INVAPP and PERFEVAL. Both accounting methods provide a means of controlling delegated capital expenditure decisions. It would seem to follow, therefore, that positive associations will be expected between INVAPP and the variables reflecting interconnectedness, operating autonomy, and capital expenditure autonomy.

Hypothesis H_5:

> The use of discounted cash flow techniques to evaluate divisional capital expenditures is associated with the use of performance measures which include an explicit adjustment for capital employed and the extent of divisional autonomy reflected by the interconnectedness, operating autonomy, and capital expenditure autonomy variables.

It was argued earlier that the divisional performance measures which reflect capital employed (such as residual income and return on investment) may not be used because capital expenditure decisions are controlled in some other way, for instance, through *ex post* controls of capital expenditures. If this argument is accepted, a negative association would be expected between PERFEVAL and EXPOST.

Hypothesis H_6:

> *Ex post* controls of divisional capital expenditures are used as alternatives to divisional performance measures which include an explicit adjustment for capital employed.

It must be emphasized that hypothesis H_6 is an alternative to hypothesis H_4—in other words, hypothesis H_6 could provide an explanation for PERFEVAL in the event that the associations between PERFEVAL and the divisional autonomy variables predicted by hypothesis H_4 are not observed. If hypothesis H_4 is rejected, the following additional hypotheses follow from hypothesis H_6:

Hypothesis H_{6a}:

> *Ex post* controls of divisional capital expenditures will be used in conjunction with discounted cash flow analysis of divisional capital expenditures.

Hypothesis H_{6b}:

> The use of *ex post* controls of divisional capital expenditures is associated with the extent of divisional autonomy as reflected by the interconnectedness, operating autonomy, and capital expenditure autonomy variables.

The associations predicted by the above hypotheses are summarized in Figure 1. Note that the last part of the figure (i.e., the line labelled EXPOST) cannot be interpreted in conjunction with other parts since it relies on the assumption that no associations are observed on the line labelled PERFEVAL.

Finally, the hypotheses set out above relate only to the associations which are expected between the variables included in the study. It is not suggested that these variables explain the diversity of accounting practices in divisionalized companies; many other variables would be needed for that purpose. In the statistical analysis which follows, we will be looking for associations which are statistically significant, in the sense that they are unlikely to occur by chance.

To summarize, positive associations are expected between the variables studied, with the exception that a negative association is expected between PERFEVAL and EXPOST if hypothesis H_4 is not supported. The general hypothesis is that there will be associations between the accounting variables and the divisional autonomy variables included in the study. The null hypothesis is that such associations will not be present.

RESULTS

Because of the nature of the scales used to construct the 12 variables, parametric statistical techniques could not be used to analyze the data. Kendall's tau correlation coefficients were calculated for each pair of variables and further analyses were carried out to confirm the conclusions drawn.

Table 5 contains the Kendall's tau correlations for the U.S. and U.K. data. The most striking feature is the relatively few significant correlations. The variables within each of the first two groups, interconnectedness and operating autonomy, have significant correlations and there are some significant correlations between the variables in those two groups, especially in the U.S. Otherwise, there are very few significant correlations.

Although NEWFIN in the U.K. and CAPBUD in the U.S. are positively associated with the variables representing interconnectedness and operating autonomy, the lack of significant correlations within the group of variables representing capital expenditure autonomy suggests that the three variables, NEWFIN, CAPEXP, and CAPBUD, may not capture an underlying factor. Thus, whereas the null hypothesis of no association can be rejected in favor of hypothesis H_1 in the case of interconnectedness and operating autonomy, it cannot be rejected in the case of capital expenditure autonomy.

The association between operating autonomy and interconnectedness predicted in hypothesis H_2 was found in the U.S. data, but not in the U.K. data (although there were some significant correlations in the U.K.). Since the third group of variables does not adequately reflect capital expenditure autonomy, the association between interconnectedness and capital expenditure autonomy cannot be tested. Nevertheless, the individual variables can be considered.

The significant correlations between CAPBUD and the interconnectedness variables indicate that highly interconnected organizations tend to centralize the preparation of capital budgets. The associations between NEWFIN and the

FIGURE 1

EXPECTED ASSOCIATIONS

Variable Name	*INTER-DEP*	*CENT-FNC*	*CASH-RTN*	*BUDGET*	*PURCH*	*SELLPR*	*NEWFIN*	*CAPEXP*	*CAPBUD*	*PERF-EVAL*	*INVAPP*	*EXPOST*
INTERDEP	H_{1a} + +											
CENTFNC												
CASHRTN												
BUDGET	H_2 +			H_{1b} + +								
PURCH												
SELLPR												
NEWFIN	H_2 +			H_3 +			H_{1c} + +					
CAPEXP												
CAPBUD												
PERFEVAL	H_4 +			H_4 +			H_4 +					
INVAPP	H_5 +			H_5 +			H_5 +			H_5+		
EXPOST	H_{6b} +			H_{6b} +			H_{6b} +			H_6−	H_{6a}+	

+ positive association
+ + strongly positive association
− negative association

TABLE 5
MATRICES OF KENDALL'S TAU CORRELATIONS

Variable Name	*INTER-DEP*	*CENT-FNC*	*CASH-RTN*	*BUDGET*	*PURCH*	*SELLPR*	*NEWFIN*	*CAPEXP*	*CAPBUD*	*PERF-EVAL*	*INVAPP*	*EXPOST*
						U.S. Data						
INTERDEP	1.00											
CENTFNC	.52**	1.00										
CASHRTN	.55**	.52**	1.00									
BUDGET	.14*	.13*	.06	1.00								
PURCH	.15**	.25**	.23**	.16**	1.00							
SELLPR	.12*	.07	.18**	.18**	.20**	1.00						
NEWFIN	−.06	−.02	−.03	.12*	.04	.11	1.00					
CAPEXP	.02	.09	.07	.06	.01	.03	.01	1.00				
CAPBUD	.20**	.25**	.17*	.04	.10	.19**	−.07	−.09	1.00			
PERFEVAL	−.04	−.01	−.15*	−.01	.03	.10	−.10	.04	.22**	1.00		
INVAPP	−.18**	−.06	−.12*	−.06	−.10	−.03	.04	.07	−.04	−.07	1.00	
EXPOST	−.02	.04	−.01	−.05	.09	.01	−.04	.02	.08	.05	.24**	1.00
						U.K. Data						
INTERDEP	1.00											
CENTFNC	.49**	1.00										
CASHRTN	.49**	.44**	1.00									
BUDGET	.06	.04	.08	1.00								
PURCH	.09	.18**	.10	.21**	1.00							
SELLPR	.08	.15**	.12*	.20**	.33**	1.00						
NEWFIN	.13*	.12*	.14*	.20**	.03	.10	1.00					
CAPEXP	.03	.03	.08	−.03	−.02	.04	−.01	1.00				
CAPBUD	.13*	.13*	.10	.05	.06	.03	.12	.12	1.00			
PERFEVAL	−.04	.05	.02	.04	.10	.07	−.08	−.08	.10	1.00		
INVAPP	−.13*	−.16**	−.13*	.05	.06	.06	−.04	.02	.03	.09	1.00	
EXPOST	.02	−.06	−.06	.02	−.01	−.01	.01	−.01	−.01	.15*	.16**	1.00

* Significant at the .05 level.
** Significant at the .01 level.

interconnectedness variables are significant in the U.K., but not in the U.S. The lack of significance in the U.S. reflects a general tendency for U.S. companies to centralize the raising of new financing. In the U.K., however, there appears to be some decentralization in companies which have relatively independent divisions.

Hypothesis H_3 cannot be tested directly because the variables selected to reflect divisional capital expenditure autonomy do not appear to have captured an underlying factor. It is worth noting, however, that there are very few significant associations between the operating autonomy variables and NEWFIN, CAPEXP, and CAPBUD.

There are few significant correlations between the accounting variables and the divisional autonomy variables. Except for CASHRTN and CAPBUD in the U.S., there are no significant associations between the divisional autonomy variables and PERFEVAL. Thus, the null hypothesis cannot be rejected in favor of hypothesis H_4. A similar conclusion can be drawn concerning hypothesis H_5, although there are some significant correlations between the interconnectedness variables and INVAPP, both in the U.S. and the U.K. These significant correlations, however, do not have the predicted sign. There appears to be a tendency to use discounted cash flow techniques to evaluate divisional capital expenditure projects in the more highly interconnected companies. This suggests that such techniques are part of the centralized decision-making process, rather than a means of monitoring delegated decisions.

Since hypothesis H_4 was not supported, it was appropriate to consider hypothesis H_6. The expected negative correlation between PERFEVAL and EXPOST was not observed. The positive correlation in the U.K. data suggests a tendency for *ex post* capital expenditure controls to be used together with performance measures which reflect the capital asset base. The two accounting techniques do not appear to be alternatives as hypothesized. The significant positive correlation between INVAPP and EXPOST observed in both the U.S. and the U.K. indicates that *ex post* audits tend to be used when discounted cash flow techniques are used for the evaluation of divisional capital projects—as predicted by hypothesis H_{6a}.

Finally, hypothesis H_{6b} must be rejected since there are no significant correlations between EXPOST and the divisional autonomy variables.

Thus, the tau correlations provide little support for the general hypothesis of the study that there is an association between the accounting methods used in divisionalized companies and the autonomy of divisional managers. To confirm this conclusion, further analyses were carried out using the "Guttman-Lingoes (G-L) Nonmetric Program Series" [Lingoes, 1973].[2]

The G-L Conjoint Measurement III (CM-III) Program was used to rescale the data such that product moment correlation coefficients could be used. The resulting correlation matrices were not substantially different from the tau matrices. This similarity was confirmed by examining visual representations of the matrices, obtained using the G-L Smallest Space Analysis Program—MINISSA-1(M) [Guttman, 1968; Lingoes, 1965; Roskam and Lingoes, 1970].

The G-L Nonmetric Factor Analysis Program, SSA-III [Lingoes and Guttman, 1967; Lingoes, 1966] was applied to both the Kendall's tau and the rescaled data as a further test of hypothesis H_1.

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[2] The results of the secondary analysis are available upon request from either of the authors.

This program extracted factors corresponding to interconnectedness and operating autonomy but was unable to locate any underlying factor corresponding to capital expenditure autonomy. This confirmed the conclusion concerning hypothesis H_1 reached using the Kendall's tau correlations. In general, the factor analysis and multidimensional scaling did not add to the insights obtained by examining the tau correlations. They did, however, provide confirmation of the interpretations discussed above.

Finally, tests were undertaken in an attempt to identify industry or size effects in the data. There were no significant correlations between the variables included in the study and the industry or size of the responding companies.

CONCLUSIONS

This study has failed to locate the expected associations between accounting methods used in divisionalized companies and the autonomy of divisional managers. There are no grounds to support rejection of the null hypothesis of no association. The expected relationships were observed within the groups of variables reflecting interconnectedness and operating autonomy, but the variables selected to represent capital expenditure autonomy failed to capture an underlying factor.

The associations between the accounting variables and variables within the interconnectedness and operating autonomy groups either were not significant or had the wrong sign. Thus, the study provides no support for the general hypothesis that differences in the extent of divisional autonomy contribute to the variety of accounting methods used to control divisionalized operations.

It was suggested earlier that the possibility of controlling capital expenditure decisions through *ex post* controls might explain some of the variety in divisional performance measures. The expected negative association between PERFEVAL and EXPOST was not observed. In fact, there was a weak, but significant, positive association in the U.K. between the two variables. The only general comment that can be made about the accounting variables, PERFEVAL, INVAPP, and EXPOST, is that there is a slight tendency for all three accounting methods to be used together. The use of *ex post* controls does not, therefore, help to explain the variety of performance measures used in the divisionalized companies in this study.

Despite differences in the extent to which particular accounting methods are used in the U.S. and the U.K., especially in the case of discounted cash flow techniques and post-completion audits (see Tables 1, 2, and 3), the two tau correlation matrices in Table 5 look remarkably similar and the general conclusions of the statistical analyses of the two data sets are the same for both countries. This similarity in the statistical analyses of the two data sets provides a measure of confirmation for the statistical methods. Nevertheless, caution must be exercised in interpreting the results. The *ad hoc* nature of the scales used to quantify the 12 variables was discussed earlier.

A further problem may arise from the use of questionnaires. A mail questionnaire of the type used in this study will elicit responses which reflect formal control systems. Such formal control systems, however, are only one of the methods used to control complex organizations [Galbraith, 1977]. Informal systems which are embodied in the organization culture can be major components of the organizational control process [Ouchi, 1979]. The existence of informal control mechanisms may confound the relationship between accounting variables and variables used to reflect divisional autonomy [Scapens and Sale, 1981b]. Thus, the possibility of misspecification has to be acknowledged.

The post-questionnaire interviews suggested possible explanations for the failure to locate the expected associations. First, in most cases, all available accounting methods will be imperfect. There will not be a "correct" method. The choice of accounting methods, or combination of methods, will be influenced by anticipated costs and benefits of the information and these will be situation-specific [Demski and Feltham, 1976]. Second, the evolution of an accounting system is a dynamic process, and there are unlikely to be simple static relationships between accounting methods and organizational variables. Third, the personalities and backgrounds of key individuals within an organization can affect the choice of accounting methods. In a study of the role of controllers in large organizations, Sathe [1982] found only weak or no associations between controller involvement in management and organizational characteristics, but he found a strong association between controller involvement and the personal characteristics of corporate management.

These three factors could explain the failure of this exploratory study to find associations between accounting methods and divisional autonomy. Furthermore, they indicate that there may be no simple static relationships between accounting methods in divisionalized companies and organizational variables. There is a need for more research in this area. One possible approach would be to study the dynamics of management control processes in their organizational contexts through longitudinal studies of individual companies. The possibility of studying accounting practices in their organizational contexts is explored in Roberts and Scapens [forthcoming]. Such studies could then provide a basis for reformulating the hypotheses tested in this paper.

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THE ACCOUNTING REVIEW
Vol. LX, No. 2
April 1985

Auditor Switches by Failing Firms

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ABSTRACT: This study examines the motivations for failing firms to change auditors. Some of the factors that could influence auditor switching include audit qualifications, reporting disputes, management changes, audit fees, and insurance needs. Annual reports, 10-Ks, and proxy statements were used to gather data for a sample of 132 failing (bankrupt) firms and a matched-pair sample of nonfailing firms. The investigation's findings strongly supported our prior expectations that failing firms have a greater tendency to switch auditors than do healthier firms. Other findings revealed that neither audit qualifications nor management changes were statistically associated with auditor displacement in failing firms. Failing firms that changed auditors did display a preference to move to a different class of CPA firms. Also, size did not appear to matter with respect to the observed auditor switching among the failing firms, although it appeared to have some effect among control firms. Overall, our study's major findings suggest a definite need to control for the presence of financial distress in studies on auditor switching.

INTEREST among both academics and practitioners in the phenomenon of auditor switching has grown in recent years. This topic has broad implications for understanding the dynamics of the market for audit services and the degree of competition in the auditing profession. The Securities and Exchange Commission (SEC) has expressed concern over auditor switching in a number of Accounting Series Releases (e.g., SEC ASR No. 165 [1974]; No. 194 [1976]; No. 247 [1978]), which required increased disclosure as a means for discouraging corporate management from changing CPA firms to obtain an unqualified audit opinion or more favorable accounting treatment. These increased disclosure requirements are intended to create a reporting environment in which auditors are better able to exercise their independence and, if necessary, take positions that are not in accordance with client preferences.

A variety of reasons for switching auditors have been suggested, but empirical evidence in this area has been both limited and inconclusive. Changes in corporate management, the need for additional auditing services, disagreements over reporting matters, and conflict over audit fees have frequently been cited as motivating firms to initiate a search for a new CPA [Burton and Roberts, 1967; Carpenter and Strawser, 1971; Bedingfield and Loeb, 1974; Macchiaverna, 1981; Chow and Rice, 1982; DeAngelo, 1982; and Eichenseher and Shields, 1983].

This study considers the additional factor of financial distress as a variable influencing auditor switching. Recent

The authors gratefully acknowledge the comments of an anonymous reviewer. Helpful comments were also provided by the participants in the Boston University Accounting Research Forum.

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Manuscript received April 1984.
Revisions received July and October 1984.
Accepted November 1984.

speculation suggests that firms in financial distress may have greater incentive to change their auditors. Reports circulating in the financial community often allege that some failing companies decide to replace their auditor because of disputes over accounting methods, displeasure over the type of audit opinion, or dissatisfaction with an auditor's failure to detect significant weaknesses in internal accounting controls or extensive inaccuracies in the company's records.[1] We hypothesize that in a failing firm environment there are increased incentives for management and auditors to sever their ties. The pressures stemming from financial distress can put a strain on auditor-client relations and produce irreconcilable differences. Further, we argue that the failure to control for economic condition may have confounded the results of some earlier studies.

The remainder of this paper is divided into four sections. In Section 1 we discuss the failure-related factors that can lead to auditor displacement. Incentives for managers to seek new auditors and for auditors to seek disengagement are explored. The subsequent section presents empirical findings on the incidence of auditor switching among distressed companies. In Section 3, we provide evidence pertaining to some factors identified earlier in the paper as influencing auditor switching in these companies. The final section summarizes the major findings of our study.

1. INCENTIVES FOR FAILING FIRMS TO CHANGE AUDITORS

The accounting literature currently offers several explanations for why firms change auditors. For example, Carpenter and Strawser [1971] found that companies going public favored retaining the services of a Big Eight CPA firm because of the prestige that it might add to the security offering. Management changes was identified by Burton and Roberts [1967] as being a major factor leading to auditor changes. Eichenseher and Shields [1983] found audit fees and a "good working relationship" (which they defined as the CPA firm's responsiveness to a client's need) as the two most important factors influencing auditor selection. DeAngelo's [1982] study of auditor switching in the oil and gas industry identified a tendency for companies to choose an auditor who favored an accounting method that was consistent with the method favored by management. Finally, evidence supporting the belief that auditor switching is associated with audit qualification decisions is reported in Chow and Rice [1982].

These prior studies have attempted to isolate factors considered to be conducive to auditor switching and have added to an understanding of the market for audit services. Still, a general theory that explains why firms change auditors is yet to emerge. One promising approach to developing such a theory is to consider the package of services offered by different auditing firms as a differentiated product (see, for example, Dopuch and Simunic [1980]). Product differentiation in the market for audit services can result from a CPA firm's reputation (i.e., its brand-name image), industry specialization or technical expertise, geographic dispersion of audit offices, responsiveness to client needs, and ability to provide additional non-auditing services. The purchaser of audit services must evaluate the benefits from alternative packages of audit services in terms of their cost.

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[1] Some anecdotal evidence of this can be found in "More Ailing Concerns are Firing Auditors in Hope of Keeping Bad News from Public," *The Wall Street Journal*, May 12, 1983, p. 35, and "AM International Says Year's Loss was $250 Million—Bigger Estimate is Blamed on Write-Off, Divestitures; Price Waterhouse is Fired," *The Wall Street Journal*, December 2, 1981, p. 21.

The nature of the audit services demanded by a company is influenced by a number of firm-specific characteristics. A distressed company's needs can be different from what a healthy company is looking to receive. Additionally, the change in a company's financial condition may produce a change in the desired package of audit services. This section includes a discussion of the pressures within a failing firm environment that may give rise to auditor changes. The incentives for auditor switching are examined from both the manager's and the auditor's perspectives.

Reporting Disputes and Qualified Opinions

Corporate management has primary control over the production and disclosure of information about the firm. Various bonding arrangements and monitoring devices attempt to mitigate the divergence between the interests of managers and owners. Fama [1980] and Barnea, Haugen and Senbet [1981] have contended that there are labor market forces which impose penalties on managers in the form of future wage revisions for signaling falsely and conveying wrong expectations.

There is, however, a basis for believing that when corporate existence is threatened, management's compensation outlook may suffer from myopia. Schwartz [1982] found that financially distressed companies make more income-increasing accounting changes than healthy firms and suggested that accounting changes made by these companies may convey subjective information concerning management's feelings about the company's well-being. Management might attempt to suppress or delay the dissemination of negative information or select accounting methods that temporarily mask some economic attributes of the company's financial condition.

Auditors may express displeasure over the accounting methods and disclosure policies advocated by management and may find them to be unsupportable. In addition, the deteriorating financial condition of the client could result in the auditor insisting upon issuing a qualified opinion. Managers might believe that receiving a qualified opinion could depress the price of a firm's securities or impair its ability to raise adequate financing or maintain the firm's bank support.[2] The issuance of a going concern qualification carries with it the possibility of becoming a self-fulfilling prophecy. Thus, both disagreements over the appropriateness of accounting principles and impending audit qualifications could strain the auditor-client relationship. The client may initiate a search for a new auditor whose views on important reporting issues are more acceptable to management.

Management Changes

There is a tendency for failing companies to make management changes in an attempt to resuscitate the organization [Schwartz and Menon, forthcoming]. Failure to achieve corporate objectives can bring about a redistribution or transfer of power within the organization. When corporate survival rests upon the continued support of investors and lenders, these capital suppliers often take a more active role in shaping the scope and direction of corporate activities. External stakeholders may identify management weaknesses as a principal factor in the company's deteriorating financial condition and insist upon management changes as a condition for their continued support.

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[2] Firth [1980] found that the disclosure of uncertainties in the auditor's report can be a significant element in bankers' lending decisions. However, recent studies on the market reaction to audit qualification announcements suggest that stock prices are unaffected by qualification decisions (e.g., Davis [1982], Elliott [1982], and Dodd, et al. [1984]).

This discontinuity in management may bring about alterations or breaks in existing corporate relationships. New management may be dissatisfied with the quality of past services provided by the company's auditor, as well as with the cost of the audit. A new management team charged with the responsibility of bringing about a corporate recovery may view the selection of reporting methods as a means for influencing the decisions of suppliers of capital by portraying corporate performance in a more favorable light, and this may be facilitated by finding an auditor willing to sanction those methods advocated by management. Additionally, new managers might want to disassociate themselves from their predecessors' practices and policies, and could be unhappy with the old auditor's concurrence with some of these policies. Or alternatively, new managers may merely prefer another auditor with whom they have had some previous association.

Insurance Demand and Audit Fees

Failing firms may consider switching from smaller to larger CPA firms to provide greater assurances to investors and creditors. The attestation of financial statements by larger, well-known CPA firms might convey more strongly the absence of negligence or management fraud. Further, failing firms may seek out the services of larger accounting firms because they can provide additional insurance against potential claimants in the event of financial loss from corporate failure.

This contention is born out of the "insurance" hypothesis of auditing. This hypothesis (see, for example, Wallace [1980]) views the demand for auditing as being partially explained by the need for businesses to search out insurance for liabilities that might arise in the event of bankruptcy. Auditors cast in this role of co-insurer against corporate failure can have "deep pockets" in the event a bankrupt client is unable to pay losses from litigation. This insurance demand, which arises out of the auditor's professional liability exposure, can be thought of as a means for distributing risk. Thus management, given the authority and responsibility to report on the financial status and activities of the firm, can limit its own liability exposure and that of any related third parties.

Larger CPA firms can have "deeper pockets" when it comes to providing this insurance. They could also have a comparative advantage in providing insurance because of their ability to distribute client risk over a greater number of clients. Larger CPA firms may be better equipped to provide services needed by some distressed clients because of their superior in-house legal and technical advisory staff.

An obvious concern of the auditor is the need to manage business risk and reduce the danger of civil suit and legal sanction. Clients that collapse into bankruptcy may leave the auditor more vulnerable to allegations of failure to detect reporting deficiencies. This can be harmful to a CPA firm's professional reputation. Auditors would want to be compensated for providing the additional insurance which a distressed client might require.

Incentives to change auditors can also stem from a desire on the part of the financially distressed company to reduce audit fees. These fees often run to several hundred thousand dollars for larger companies and may be influential in the selection of an auditing firm. At the same time that a distressed company may be looking for additional insurance, it may be trying to reduce audit fees. Yet an increased insurance demand could lead to a higher audit fee which a distressed company will find difficult to absorb.

As discussed earlier, CPA firms offer audit products that are differentiated along several dimensions, of which insurance is one. A company will optimize the package of services it receives by making trade-offs among the various dimensions of the audit product subject to the constraint of audit cost. A deterioration in financial condition can result in the purchasers of the audit services changing the importance attached to different dimensions of the audit product as well as to the cost of the audit itself. For example, a distressed company may place greater emphasis on the insurance aspect of the audit product, or may be primarily concerned with reducing the cost of having the audit performed. A client's preferences for different attributes of the audit product can vary even among failing firms. However, the likelihood of a change in the desired audit product should increase when financial distress appears.

The deterioration in a client's financial condition may necessitate expanded audit procedures and consequently an increase in the cost of providing audit services. Auditors may find it difficult to pass on such cost increases to distressed clients, which may bring into question the profitability of carrying such clients' accounts.[3] While such considerations should apply equally to other auditors, who must also bear any initial set-up costs associated with having a new client, some auditors may use a strategy of accepting client accounts that are marginal in the short run but could prove to be profitable on a long-term basis.

When a client's primary motivation for changing auditors is to reduce audit fees, the expected direction of the auditor switch (i.e., to or from the Big Eight) is unclear. Dopuch and Simunic [1980] have contended that Big Eight firms may benefit from certain scale economies which allow them to provide their services to clients at lower fees, and Simunic's [1980] findings can be interpreted as supporting this contention. Bedingfield and Loeb [1974], on the other hand, reported that some of the companies responding to their questionnaire had changed from national to smaller CPA firms to reduce their audit costs. It may be that some larger CPA firms are in a better position to accept distressed client accounts because of comparative cost advantages, while smaller CPA firms are more aggressive in attempting to attract publicly held clients and offer their services for a lower fee.

The Relevance of Financial Distress in Auditor Switching

The financial distress variable can be viewed as influencing auditor switches in two different ways: (1) The complex business uncertainties present in financially distressed firms may create conditions which are conducive to switching auditors, since financial distress may be correlated with the existence of factors that give rise to auditor switching. These determinants might be reporting disputes or anticipated qualified opinions, management changes, audit fees, or "insurance" motives (all of which were discussed earlier in this section), as well as other unidentified factors. Because these factors may prevail more often in a faltering business, financially distressed companies may tend to have a greater propensity to make auditor changes than healthy ones. (2) The influence of factors which are instrumental in auditor switching may be contingent upon the financial condition of the firm. First, the factors associated with auditor changes in distressed companies may not be the same factors that are associated with auditor changes in financially healthy companies. Second, the relative importance of various factors may depend upon the financial condition of the firm. Auditor switches in healthy companies, for example, may be motivated by such factors as the client's need for additional services, or the successor auditor's demonstrated skill or experience in the particular industry in which the client conducts its business. Such factors as audit fees or reporting changes may prove more touchy issues for failing companies than for healthy ones.

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[3] In addition, the collectibility of audit fees in such circumstances may become uncertain. An interesting case in point is Western Orbis Company, which filed for bankruptcy in 1976. The Company's auditors through June 1975 resigned from the engagement for reasons that included delinquent accounting fees. The new auditors apparently encountered a similar problem as evidenced by the following statement made by the Company on its 10-K for 1975: "No financial statements are filed as Registrant was forced to suspend its annual audit in September, 1975 due to lack of funds to pay its auditors. Since that date Registrant has not been able to resume the audit due to lack of such funds."

In whichever way financial distress may affect the auditor-client relationship, its existence can have some implications for understanding the dynamics behind auditor switching. Whereas several of the factors that have been considered as causes of auditor switching may be found to exist in failing companies, not all of these need actually lead to auditor switches. If financial condition is not explicitly controlled for, an obvious "omitted variables" problem can exist, since a correlation of both a spurious factor and a "true" determinant with financial distress could lead to making some invalid inferences on why companies decide to change auditors. This being the case, there are clear limitations to the generalizability of findings that are based on experimental samples containing both failing and healthy firms.

In the next section, we provide the results of an empirical test which shows that failing companies exhibit a greater propensity to change auditors than do healthy companies. In Section 3, we assess the importance of some of the factors that have been argued to provide incentives for auditor switching.

2. EMPIRICAL EVIDENCE ON AUDITOR SWITCHING

A matched-pairs design was used to compare the incidence of auditor switching between failing and healthy firms. The sample of failing firms consisted of companies that filed a bankruptcy petition during the years 1974 to 1982. Only companies whose shares were publicly traded in the years prior to bankruptcy on either the New York Stock Exchange (NYSE) or the American Stock Exchange (AMSE) were included in the sample.

A list of 141 bankruptcies was compiled from *The Wall Street Journal Index* for the years under consideration. Three firms were excluded from the sample because they were forced to make auditor changes in the years immediately preceding their bankruptcy due to the dissolution of their auditors. Six other firms were omitted because of the unavailability of data.

The final sample of 132 bankrupt companies constituted a cross-section of publicly held companies, approximately one-half of which were manufacturers and the remaining one-half retailers, wholesalers, transportation companies, or service concerns.[4] Over 70 industries were represented, as distinguished by the four-digit SIC code. Approximately two-thirds of the sample firms were listed on the AMSE with the remaining one-third on the NYSE.

A control group was developed by

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[4] The service companies in our experimental group included some companies offering diversified financial services. Banks and savings and loan institutions were excluded from our sample due to the closely regulated nature of the environment in which they operate.

matching each bankrupt company with a non-bankrupt company listed on the NYSE or AMSE, which was selected on the basis of industry (primary four-digit SIC) and size. Matching on the basis of industry helped to reduce the possibility of confounding the results due to an industry bias. DeAngelo's [1982] findings suggest that this concern can be particularly relevant to studies on auditor switching. Certain companies may show more of a tendency to switch auditors because of pressures induced by industry-specific environmental variables (e.g., the controversy surrounding accounting for oil and gas activities).

Matching was done by selecting the company within the four-digit SIC that was nearest in revenue to the bankrupt company in the fourth year prior to the year of bankruptcy filing. This period was selected for matching because failing firms frequently report revenues in the years immediately preceding bankruptcy that are atypical of their prior performance. Size was chosen as a criterion for matching because it has been demonstrated previously (e.g., Eichenseher and Shields [1983]) to be an intervening variable that may play a role in auditor switching.

The examination period for this study consisted of the four years immediately preceding the date of bankruptcy filing. Experimental firms were classified as "switchers" if they had changed their auditors during this period, and as "non-switchers" if they did not make such a change.[5] The event date in the case of the control firms was defined as the date of bankruptcy filing of the corresponding experimental firm. Firms in the control group were also classified into the same two categories depending upon whether the particular control firm had changed its auditor in the four years preceding the event date.

Data were gathered by examining company annual reports, 10-Ks, and proxy statements. In a few cases, these sources were unavailable to us, and we relied upon secondary sources like *Moody's Industrial Manuals, Leasco's Disclosure Journals* and *Who Audits America.* Whenever possible, data from a secondary source were cross-checked with another secondary source to increase reliability. Auditor "changes" resulting from mergers of the old auditor with the new auditing firm were not treated as switches.

We used the Chi-square test for independence of classification to determine whether the tendency for failing companies to switch auditors is different from that of non-failing companies. A 2×2 contingency table was set up for this purpose (see Table 1). This table shows that 35 of the 132 bankrupt firms in the experimental sample had changed auditors in the four years preceding bankruptcy, whereas only 13 of the control firms had made a change over the same four-year period. The null hypothesis of no association between the classification of a firm as "bankrupt" or "non-bankrupt" and the tendency to switch auditors was rejected (Chi-square$=12.32, \alpha<0.001$).

An analysis of the timing of the auditor switches made by the 35 failing firms reveals that the closer a company gets to bankruptcy, the more likely it is to change its auditor. Whereas only four of the bankrupt companies in the sample made

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[5] Since companies are sometimes required to change auditors while in bankruptcy, we were careful to distinguish between post-bankruptcy auditor switches and pre-bankruptcy switches, the latter being the event of interest in this study. In addition, auditor changes made by any subsidiaries of companies in our sample were not considered. To the best of our knowledge, the companies in our sample were not controlled by other firms. Exclusion of subsidiary firms is necessary due to the obvious influence that a parent company can have on its subsidiary's selection of an auditor.

TABLE 1
THE ASSOCIATION BETWEEN FINANCIAL DISTRESS AND AUDITOR SWITCHES

	Bankrupt	*Non-Bankrupt*	*Row Totals*
Switched CPA firms	(1) 35	(2) 13	48
Did not switch CPA firms	(3) 97	(4) 119	216
Column Totals	132	132	264

auditor switches in the fourth year prior to bankruptcy and six companies in the subsequent year, the number of bankrupt companies observed switching auditors increased to ten in the second year prior to bankruptcy and to 15 in the one-year period immediately preceding bankruptcy.[6] This pattern supports our initial contention that financial distress is a critical variable influencing the decision to switch auditors.

3. ADDITIONAL EVIDENCE ON AUDITOR SWITCHING

Earlier in the paper, we explored various factors which could have an effect on the auditor-distressed client relationship. The data collected in this study permitted us to test the strength of some of the hypothesized associations.

Audit Qualifications[7]

The hypothesized relationship between qualified opinions and auditor switches is based on the belief that companies would like to avoid receiving such opinions and would, consequently, be prepared to change auditors to prevent it. The motivation to make a switch presumably originates when it is *anticipated* that the current auditors will qualify their opinion. Since this anticipation cannot be measured, the hypothesis that auditor switches are associated with anticipated audit qualifications cannot be tested directly. The importance of audit qualifications as a factor influencing auditor switches can, however, be argued more strongly when it is observed that qualified audit opinions are followed by auditor switches.

To test the hypothesis that qualified opinions are followed by auditor switches, data were gathered for 128 of the 132 bankrupt firms in our study for the four years preceding bankruptcy filing. The four firms excluded from the original sample were those that had made changes in their auditors in the fourth year prior to filing for bankruptcy. The distressed companies that made auditor changes in the three-year period prior to bankruptcy were classified as "switchers," while those companies that did not make any change were classified as "non-switchers." The companies were then classified into four categories (see Table 2), as follows:

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[6] In comparison, the 13 auditor switches made by the control group of firms occurred as follows: three in the fourth year, five in the third year, three in the second year, and two in the year immediately preceding the bankruptcy filing date for the corresponding bankrupt company.

[7] The following analysis has been restricted to examining the influence of audit qualifications. To assess directly the effect of reporting disputes would have required information on such disputes for all companies. Since the SEC 8-K requirement on disclosure of accounting disputes only applies in cases involving auditor switches, this factor was not examined here.

TABLE 2
THE ASSOCIATION BETWEEN AUDIT QUALIFICATION AND AUDITOR SWITCHES FOR FAILING COMPANIES

	Qualified	*Not Qualified*	*Row Totals*
Switched CPA firms	(1) 14	(2) 17	31
Did not switch CPA firms	(3) 63	(4) 34	97
Column Totals	77	51	128

(1) Switchers who had received a qualified opinion in the year preceding the switch.
(2) Switchers who had received an unqualified opinion in the year preceding the switch.
(3) Non-switchers who had received a qualified opinion in at least one of the four years prior to bankruptcy.
(4) Non-switchers who had received an unqualified opinion in all of the four years prior to bankruptcy.

Only companies that had audit reports qualified for reasons other than consistency were treated as "qualified" for this test.

The null hypothesis is as follows: A switch in auditors by a failing firm is not associated with a qualified opinion obtained in the year prior to the switch. A 2×2 contingency table was set up to test this hypothesis, and the Chi-square value was 3.83 ($\alpha=0.05$). However, an examination of the cells shows that a higher proportion of those companies that had not received a prior qualified opinion had switched auditors. We cannot offer any meaningful interpretation for this unexpected finding.[8]

As mentioned before, the above test cannot measure the effect of anticipated qualifications on auditor switching. Still, our findings are inconsistent with those of Chow and Rice [1982]. Chow and Rice (C-R) provide some evidence indicating that switching auditors is not independent of receiving a qualified audit opinion. Their sample contained all companies listed in Leasco's *Disclosure Journal* as having filed audited financial statements with the SEC in 1973. Approximately 88 percent of the companies filing in that year had been given a clean opinion or only a consistency exception. The examination for auditor switches covered the year immediately following the issuance of a qualified/unqualified report, which was 1974.

While C-R obtain evidence consistent with their hypothesis that audit qualifications lead to auditor switches, it could also be explained by many alternative hypotheses: (1) audit qualifications and auditor switches may both be related to other yet-to-be-specified variables (an "omitted variables" problem), (2) an association between audit qualifications and auditor switching may exist only in the presence of other unspecified variables (an "intervening variables" prob-

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[8] We repeated the qualification/switch test, excluding the five companies that switched auditors in the third year prior to bankruptcy. The remaining 123 experimental firms were categorized in a manner similar to Table 2, except that we used a two-year time frame for audit qualification and subsequent auditor change. The Chi-square test did not yield significant results.

TABLE 3
THE ASSOCIATION BETWEEN MANAGEMENT CHANGES AND AUDITOR SWITCHES FOR FAILING COMPANIES

	Changed Management	*Did Not Change Management*	*Row Totals*
Switched CPA firms	(1) 13	(2) 18	31
Did not switch CPA firms	(3) 34	(4) 63	97
Column Totals	47	81	128

lem), or (3) auditors may be imposing qualifications as a punitive response to an anticipated auditor switch [DeAngelo, 1982].

The results of our tests provide evidence consistent with the first alternative hypothesis identified above. Financial distress may be correlated both with audit qualification and with factors that are truly instrumental in auditor switching. A plausible explanation for the results obtained by C-R would be that many of the qualified opinions examined by them could have been for firms in financial distress. While our present study focuses only on companies succumbing to bankruptcy, many of the characteristics found in bankrupt firms may be sufficiently present in firms somewhat less distressed to lead to similar results. Further, our results also appear to be consistent with the second of the alternative hypotheses given. The factors motivating auditor switching in firms may differ depending upon the financial condition of the business.

There were substantially fewer audit qualifications among our control firms, as would be expected. Whereas 85 of the 132 firms in the experimental group were qualified for reasons other than consistency in at least one of the four years prior to bankruptcy, only 22 of the 132 control firms had received at least one qualified opinion over the equivalent four-year period.[9] We performed a Chi-square test on the control group of firms to see whether or not audit qualification preceded auditor switching. No association whatsoever could be found. Surprisingly, only one switcher in the control group had received a qualified opinion in the year before the auditor switch was made. This supports the first alternative hypothesis discussed for the C-R results, but in view of the relatively few auditor switches made by control firms in the present study, we hesitate to draw any definite conclusions.

Management Changes

Earlier we hypothesized that management changes may trigger alterations in the auditor-client relationship. The test for association between management changes and auditor switches was set up in the same way as the preceding test, and the same sample of 128 bankrupt companies was used. A 2×2 contingency table was set up (Table 3) using the following categories:

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[9] The discrepancy between the number of qualifications reported here and in Table 2 is due to the way we defined the cells in this table. Switchers were classified as being qualified for the purposes of the audit qualification/auditor switch test only if qualification occurred prior to the switch.

TABLE 4

DIRECTION OF AUDITOR SWITCHES MADE BY FAILING COMPANIES

	Switched to Big Eight CPA Firm	*Switched to Non-Big Eight CPA Firm*	*Row Totals*
Switched from Big Eight CPA firm	(1) 11	(2) 10	21
Switched from non-Big Eight CPA firm	(3) 12	(4) 2	14
Column Totals	23	12	35

(1) Switchers who had experienced a management change in the year preceding the auditor switch.
(2) Switchers who had not experienced a management change in the year preceding the auditor switch.
(3) Non-switchers who had experienced a management change in the four years prior to bankruptcy.
(4) Non-switchers who had not experienced a management change in the four years prior to bankruptcy.

Companies were treated as having changed management if the chief executive officer was replaced for reasons other than normal retirement or death. The Chi-square value was 0.48 ($\alpha = 0.49$). Therefore, we cannot provide support for the hypothesis that management changes are followed by auditor switches.[10] This test was repeated for our sample of control firms, but again we could not find any significance.

These findings are consistent with those reported by Chow and Rice [1982], who included management changes as one of the independent variables in their conditional logit model but failed to find the variable significant. Burton and Roberts [1967], however, used questionnaires as their data-gathering instrument and identified management changes as one of the major causes for auditor changes. While there are some cases in which management changes apparently do give rise to changes in auditors, this factor alone fails to explain the observed auditor switching in our sample of companies.

The Direction of Auditor Switches

Table 4 classifies the 35 auditor switches in our failing group by the direction of the switch. In constructing this table, accounting firms were classified into Big Eight and non-Big Eight groups. A test for independence of classification showed that there was a tendency for distressed companies making auditor switches to choose a new auditor type (i.e., either Big Eight or non-Big Eight) as a replacement (Fisher's Exact Test, two-tailed, $\alpha = 0.07$).

Earlier we said that there is product differentiation in the market for audit services and that different attributes of the audit product may become more attractive to a company as its financial condition changes. Since the change in audit product preferences can vary substantially across failing firms, however, it is difficult to formulate a hypothesis on the direction of auditor switches made by failing companies (i.e., to or from the Big Eight). We would contend that several differences exist between the audit products offered by Big Eight and non-Big Eight CPA firms. This could lead to distressed companies moving to a different class of CPA firms when an auditor change is made and provide some explanation for the results of our test.

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[10] As an additional test, we excluded the five companies that switched auditors in the third year prior to bankruptcy and classified the remaining 123 firms in a manner similar to Table 3, except that we used a two-year time lead for management changes followed by auditor switches. Still, the Chi-square test did not detect any statistical association. We also broadened our definition of a management change to include changes resulting from a CEO's normal retirement or death, but again were unable to find significant results.

McConnell [1984] provides some statistics on the direction of auditor changes made by publicly held companies over a nine-year period. He observed a tendency for non-Big Eight CPA firms to be displaced by Big Eight CPA firms among NYSE and AMSE companies changing auditors. Of those switchers previously audited by a non-Big Eight firm, 74 percent went to a Big Eight auditor. Dopuch and Simunic [1980] similarly have reported that the market share of non-Big Eight CPA firms for the Fortune 500 Industrials declined from 11.6 percent in 1955 to 3.2 percent in 1977. Our finding that distressed companies move to a different auditor type when changing auditors could at least partially be explained by this general movement to Big Eight auditors. However, our findings indicate a substantially greater proportion of formerly Big Eight audited companies selecting non-Big Eight successors (48 percent) than exists for NYSE and AMSE companies in general. McConnell's statistics indicate that only 17 percent of the companies switching from a Big Eight auditor chose non-Big Eight replacements.

A Note on Client Size

It is conceivable that the propensity of a distressed firm to change its auditor may not be the same for clients of different sizes. We tested for the influence of size to ascertain whether smaller distressed firms tend to make disproportionately more auditor switches than do larger clients.

Operating sales revenue was used as our measure of size. Revenues in the fourth year prior to bankruptcy rather than in the year of bankruptcy were chosen since, as noted earlier, failing firms frequently report revenues in the years immediately prior to bankruptcy that are atypical of their prior sales activity. This sales figure was expressed in 1967 dollars to ensure that comparable dollar figures were being used. This adjustment was considered necessary since the test involves the comparison of sales figures from different years. The Consumer Price Index for Urban Customers (CPI-U) was used to make this adjustment.

The 132 failing firms in our sample were then ranked in order of adjusted sales size. A Wilcoxon Rank Sum test was performed to determine whether the firms in the "switchers" category came from a different population from the firms in the "non-switchers" category. The normal approximation for the test produced a z-statistic of -0.13, which was not significant. There is no difference in the propensity of small versus large failing firms to switch auditors.

The same size test was repeated, this time for control firms. The test produced significant results (z-statistic $= -1.96$, $\alpha = .05$). The smaller control firms showed a greater inclination to switch auditors. This indicates that the effect of size on auditor switching may depend upon the financial condition of the firm. It should be noted, however, that "size" in these tests has been defined in relation to our sample of firms, which may not be representative of the size distribution of the population of all firms.

4. CONCLUDING REMARKS

The impetus for studying auditor switching stems from a need to understand better the nature of the demand for audit services. By examining situations where breaks in the auditor-client relationship occur, it may be possible to identify those factors that are critical in auditor selection decisions, thereby providing a basis for assessing the importance of various dimensions of the audit product. This line of research has direct implications for evaluating the effects of changes in the competitive nature of the auditing profession.

The major finding of this study indicates that there is a higher incidence of auditor switching among failing firms. An examination of some possible incentives for these switches indicates that neither audit qualifications nor management changes are associated with auditor displacement. This runs counter to some previous findings. Inspection of the direction of auditor switches showed a tendency among failing firms changing auditors to choose a different auditor type as successor. While size did not have an effect on auditor switching among the failing firms, the control companies in our sample making auditor switches were smaller than those not switching.

We consider our findings to be explained best by viewing auditor switching as an outcome of changes in the demand preferences of purchasers of audit services. The findings of earlier studies can be interpreted as having isolated some of the factors that alter this demand. Our study suggests that a deterioration in financial condition may result in a reordering of the client's preferences for the different attributes comprising the audit package, or in the auditor adjusting fees to reflect additional costs. This leads to a breakdown in the auditor-client relationship and increases the likelihood of an auditor change.

We conclude that the incentives behind auditor switching can vary depending upon the financial condition of the firm. This suggests a need to control for the presence of corporate financial distress while investigating the effect of other possible variables that may be associated with the phenomenon of auditor switching. Focusing attention on the situational or contextual variables that may influence auditor switching should contribute to developing a theory of auditor switching.

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THE ACCOUNTING REVIEW
Vol. LX, No. 2
April 1985

NOTES

Applying Citation Analysis to Evaluate the Research Contributions of Accounting Faculty and Doctoral Programs

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ABSTRACT: This study applies citation analysis to evaluate the research contributions of accounting faculties, doctoral programs, and individuals to contemporary accounting research (CAR). A research contribution is measured as CAR citations to a journal article written by an accountant, and CAR is defined as all main articles published in *The Accounting Review, Journal of Accounting Research, Journal of Accounting and Economics,* and *Accounting, Organizations and Society* between 1976 and 1982. The advantages and disadvantages of the technique are discussed, and the sensitivity of the results to alternative citation measurement metrics is examined.

1. INTRODUCTION AND MOTIVATION

PREVIOUS evaluations of the comparative research contributions of accounting faculties and graduate programs have focused on the number of articles authored by the groups of interest or the perceptions of accounting researchers of these groups.[1] An alternative quality measure, citation analysis, has been used extensively in the natural and social sciences to evaluate faculties and doctoral programs. (For a recent application to the economics discipline, see Davis and Papanek [1984].) Citation analysis measures the influence (impact) of research "X" on research "Y" by how often "Y" references "X." As stated by Cole and Cole [1972, p. 369]:

> A basic assumption in this analysis is that research cited by scientists in their

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[1] Bazley and Nikolai [1975], Andrews and McKenzie [1978], Windal [1981], and Hopwood and Williams [1983] ranked accounting departments by total journal publications. Doctoral programs have been evaluated along similar dimensions by Bazley and Nikolai [1975] and Koch, Merino and Berman [1983]. Estes [1970], Carpenter, Crumbley and Strawser [1974], and Brooker and Shinoda [1976] evaluated accounting departments and doctoral programs by the perceptions of accounting educators.

We are grateful to Tom Burns, Tom Dyckman, Paul Griffin, Ron Huefner, Bob Kaplan, Josh Ronen, Chuck Trzcinka, and Steve Zeff for their helpful comments and to Sreenivas Kamma for his diligent research assistance.

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Manuscript received May 1984.
Revision received October 1984.
Accepted November 1984.

own papers represents a roughly valid indicator of influence on their work.

The purpose of this study is to evaluate the impact of accounting faculties and graduate programs upon contemporary accounting research (CAR) by using citation analysis. The remainder of the study is divided into six sections. Section 2 discusses the citation analysis technique. Section 3 discusses our data base. The results of evaluating accounting faculties constitute Section 4. Section 5 presents results of evaluating doctoral program graduates. Evaluations of individuals constitutes Section 6. Section 7 summarizes the findings and limitations of the study.

2. CITATION ANALYSIS

Citation analysis has been used extensively in the hard sciences, social sciences, and various areas of business.[2] In accounting, citation analysis has been conducted by McRae [1974], Dyckman and Zeff [1984], and Brown and Gardner [1985]. McRae [1974] examined the pattern of information flows in the accounting information network by gathering citations from 17 accounting journals during two years (1968–69). Dyckman and Zeff [1984] used various forms of citation analysis to evaluate the impact of the *Journal of Accounting Research* over its 20-year existence. Brown and Gardner [1985] used the technique to assess the impact of journals and articles on accounting research.

Citation analysis can be employed to measure the impact of journals, individuals, faculties, and graduate programs on accounting research. The information provided by citation analysis is potentially useful to administrators, faculties, and current and prospective Ph.D. students for a variety of purposes (e.g., promotion and tenure, selection of doctoral programs, public relations). Despite its limitations, citation analysis has several advantages in comparison with publication counts and "expert" opinions, which include:

1. The procedure is objective in that it is independent of the perceptions, recollections, or personal biases of respondents.
2. It measures research impact upon the profession in a timely fashion.
3. Citations have been shown to be a better indicator of prestige than number of publications [Clark, 1957 and Cole and Cole, 1967].
4. It allows influential articles to come from journals not included in publication count samples.
5. Citation analysis includes articles published prior to the start of the publication count sample that remain influential during the publication count period.[3]

3. CITATION DATA BASE

This study evaluates the contributions of accounting faculties, doctoral programs, and individuals to contemporary accounting research (CAR). The data base consists of references by CAR, defined as all main articles published in four major accounting research journals: *Accounting, Organizations and Society (AOS), Journal of Accounting and Economics (JAE), Journal of Accounting Research (JAR),* and *The Accounting Review (TAR)* during the seven-year period, 1976 through 1982.[4] As only references *by* main articles were collected, references *by* the following articles were not included: Action Forum, Biblioscene, Methodological Issues, and Report sections (*AOS*); Capsules and Comments, and Discussant sections (*JAR*); Comments, Correspondence, Educational Research, Financial Reporting, Notes, and a Review Article (October 1980 only) sections (*TAR*). (Nevertheless, references *to* these articles were included in the data base.)

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[2] See Garfield [1979] for a review of the applications and limitations of the technique.

[3] In addition, many articles published in the publication count period exert little (or no) influence on subsequent research. Price [1965] found that in a given year, 35 percent of all papers are never cited, 49 percent are cited once, and the remaining 16 percent are cited an average of 3.2 times.

[4] Howard and Nikolai [1983] concluded from their survey that *JAR, TAR* and *AOS* are the accounting journals most consistently ranked in the top ten in

The data base contains all references *by main* articles in the above four journals *to all* articles written by accountants (i.e., as identified in Hasselback's *Accounting Faculty Directory 1983*).[5] Citations to articles written by non-accountants are not part of the data base, nor are books, monographs, and working papers written by accountants.[6] To measure the influence of research on other researchers, citations to one's own work (self-citations) were eliminated. The data base consists of 4,948 citations to 1,574 journal articles authored or coauthored by 712 accounting researchers. We begin by evaluating accounting faculties.

4. ACCOUNTING FACULTIES

Let total citations (TC) to the faculty (f) of an institution be designated as

$$\mathrm{TC}_f = \sum_{j=1}^{n_f} \sum_{i=1}^{n_j} c_{ijf}/n_i, \qquad (1)$$

where c_{ijf}/n_i equals the number of citations (c) to a research article (i) authored by an individual faculty member (j) at an institution (f) divided by the number of accounting authors (n_i) ($n_i = 1$ when measuring total citations without an adjustment for the number of authors). The citations of each faculty member (j) of an institution (f) are summed over his/her articles (n_j) and aggregated for the faculty (n_f) at that institution. A researcher's citations are credited to the institution with which he/she was affiliated during the 1982–83 academic year.[7]

Panel A of Table 1 presents accounting faculties when no adjustment is made for the number of coauthors. Panel B adjusts for coauthors by dividing each article's citations by the number of authors (n_i), a procedure used by Bazley and Nikolai [1975]. Adjusting for coauthorship gives each cited article a value of one.[8]

Panels C and D of Table 1 are, respectively, the "per faculty" equivalents of Panels A and B.[9] Dividing Equation 1 by the number of faculty members (n_f) at each institution[10] alleviates the "big

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various areas of accounting research. *JAE* was not included in the survey due to its infancy. We included *JAE* in our study as we believe that it has become a major outlet for accounting research.

[5] Although the *citing* articles had to be published in one of the above four journals between 1976 and 1982, the *cited* articles could have been published any time in any refereed journal. It was often difficult to determine whether a periodical was refereed; in some cases the publication's title was the determining factor (journal versus magazine). A list of the 100-plus journals included in our sample is available from the authors upon request.

[6] We confined our citations to journal articles because it was not possible to ascertain whether monographs, books, or conference papers were refereed, or whether working papers not designated as forthcoming were subsequently published.

[7] The procedure of crediting all citations to the individual's present institution assumes that an individual's reputation moves with him/her. Alternative approaches include attributing a researcher's citations to his/her institution at the time the research was written or published. These procedures are beyond the scope of this study and are left for future research.

[8] Without the adjustment, cited coauthored papers would receive a value equal to the number of coauthors.

[9] A minimum of three accounting faculty (graduates) was required for a faculty (graduate program) to be included in the per-faculty (graduate) evaluations. This requirement excluded some institutions which otherwise would be listed in the table(s) (e.g., Cal-Davis in the per-faculty evaluations and Case Western in the per-graduate evaluations).

[10] Total faculty consisted of accounting faculty who were deans (with teaching/research interests in accounting), full professors, associate professors, assistant professors, and any others whose cited papers were included in the data base. (Source: Hasselback's *Accounting Faculty Directory 1983*.)

TABLE 1

EVALUATING ACCOUNTING FACULTY BY CITATION COUNTS—*JAR, TAR, JAE,* AND *AOS*

Panel A			*Panel B*			*Panel C*			*Panel D*		
Total Citations			*Total Citations Adjusted for Co-authors*			*Average Citations*			*Average Citations Adjusted for Co-authors*		
Rank	*School*	*Total Citations*	*Rank*	*School*	*Total Citations*	*Rank*	*School*	*Average Citations*	*Rank*	*School*	*Average Citations*
1	Stanford	463	1	Stanford	352.17	1	Stanford	66.14	1	Stanford	50.13
2	Chicago	298	2	NYU	181.17	2	Rochester	33.75	2	Carnegie-Mellon	22.33
3	Rochester	270	3	Rochester	173.00	3	Carnegie-Mellon	31.60	3	Rochester	21.63
4	NYU	242	4	Chicago	159.17	4	Chicago	22.92	4	Chicago	12.24
5	Univ. Pennsylvania	211	5	Univ. Pennsylvania	146.67	5	Cornell	20.29	5	Cornell	11.38
6	Carnegie-Mellon	158	6	Carnegie-Mellon	111.67	6	Univ. Pennsylvania	11.72	6	Univ. Pennsylvania	8.15
7	Australia G.	144	7	Minnesota	108.83	7	Iowa	10.46	7	Iowa	7.86
8	Minnesota	143	8	Iowa	102.17	8	London	9.60	8	London	7.36
9	Cornell	142	9	Texas	90.58	9	Pittsburgh	8.82	9	UCLA	6.69
10	Iowa	136	10	Australia G.	87.83	10	UCLA	8.50	10	NYU	5.49
11	Univ. Washington	121	11	Cornell	79.67	11	Cal-Berkeley	7.40	11	Minnesota	5.18
12	Texas	118	12	Northwestern	71.50	12	NYU	7.33	12	Northwestern	5.11
13	British Columbia	100	13	Univ. Washington	70.33	13	SUNY at Buffalo	7.27	13	Pittsburgh	4.76
13	Northwestern	100	14	British Columbia	67.25	14	Northwestern	7.14	14	Cal-Berkeley	4.45
13	W. Australia	100	15	Florida	66.00	15	Minnesota	6.81	15	Michigan	4.06
16	Pittsburgh	97	16	Michigan	65.00	16	Univ. Washington	6.72	16	York	4.00
17	Florida	94	17	UCLA	53.50	17	Michigan	5.56	17	SUNY at Buffalo	3.98
18	Michigan	89	18	Pittsburgh	52.33	18	British Columbia	5.26	18	W. Ontario	3.92
19	Illinois	84	19	Illinois	50.83	19	Oregon	4.89	19	Univ. Washington	3.91
20	SUNY at Buffalo	80	20	W. Australia	50.33	20	Georgia Tech.	4.80	20	Purdue	3.83
21	Tel Aviv	79	21	S. Methodist	49.50	20	York	4.80	21	British Columbia	3.54
22	USC	77	22	USC	48.50	22	Arizona	4.79	22	Oregon	3.39
23	Cal-Berkeley	74	23	Tel Aviv	48.00	23	Purdue	4.44	23	S. Methodist	3.30
24	UCLA	68	24	Cal-Berkeley	44.50	24	U. San Francisco	4.33	24	Georgia Tech	3.10
25	Arizona	67	25	SUNY at Buffalo	43.74	25	Florida	4.27	25	Dalhousie	3.05

school" effect,[11] but it introduces a potential bias against big schools. That is, large institutions often have sizable faculty subgroups (e.g., tax, management information systems) whose works may not be cited by CAR, but instead by certain specialized journals (e.g., *Journal of Taxation; Journal of Systems Management*).

One drawback of the Table 1 analysis is that one "top" researcher at an institution may exert a substantial impact on a school's rankings. Since a faculty member's citations are credited to his/her current institutional affiliation, movement of a top researcher can drastically affect a school's standing. To take into account the possible dependency of a faculty evaluation on a key researcher, Table 2 replicates Table 1 with the exception of the elimination of the citations to the most often cited researcher at each school.[12]

A criticism of the analyses presented to this point is that total citation counts do not reflect the breadth of impact or influence of a faculty's research. A faculty whose ten members each receive two cites is rated identical to a faculty who has only two of its ten members cited, and each is cited ten times. Therefore, to incorporate breadth of impact in conjunction with "quality" of article into a ranking scheme, faculties were ranked according to the percentage of the institution's faculty with X or more papers cited Y or more times. (The X can be interpreted as breadth and the Y as quality.) Table 3 presents faculty evaluations along three paper/citation dimensions: one/ten (Panel A), three/five (Panel B), and five/three (Panel C).

Three of the top four schools are the same in each of the 11 panels of Tables 1 through 3—Stanford, Rochester, and Chicago. Nevertheless, considerable variability of rankings exists across the 11 dimensions for most other schools. While each of the ranking schemes presented above has logical validity along some dimension(s), no one approach is considered universally superior in the citation literature.

5. EVALUATING ACCOUNTING GRADUATES

An institution's research quality can be measured along a second dimension: the research productivity of its graduates.[13] While the ranking of faculty over a specified time interval depends upon movement of key researchers between schools, graduates will be incorporated into an institution's graduate ranking regardless of their current institutional affiliation. Total citations (TC) to the graduates (g) of an institution can be expressed as

$$\mathrm{TC}_f = \sum_{g=1}^{n_f} \sum_{i=1}^{n_g} c_{igf}/n_i, \tag{2}$$

where c_{igf}/n_i is equal to citations (c) to a research article (i) authored by a doctoral graduate (g) of an institution (f), divided by the number of authors (n_i) ($n_i = 1$ if no adjustment for coauthors). The citations of each graduate (g) of an institution (f) are summed over his/her articles (n_i) and aggregated for all graduates of that institution (n_g). Tables 4–6 replicate Tables 1–3, but apply our procedures to graduates rather than faculties.

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[11] The "big school" effect arises when a large faculty with few citations per faculty member is ranked higher than a small faculty with many citations per faculty member.

[12] Due to the coauthor adjustment, the most often-cited faculty member eliminated from Panels A and C need not be the same faculty member eliminated from Panels B and D.

[13] When calculating average citations per graduate, the divisor (number of graduates) was obtained from the list of total graduates published in Hasselback's *Accounting Faculty Directory 1983*. The number of schools included in the graduate rankings is therefore limited to Ph.D. (DBA)-granting institutions. To equate the populations of the numerator and denominator, citations in this section were confined to doctorally qualified graduates of these institutions.

TABLE 2

EVALUATING ACCOUNTING FACULTY BY CITATION COUNTS—*JAR, TAR, JAE* AND *AOS*
TOP-CITED RESEARCHER ELIMINATED

Panel A			*Panel B*			*Panel C*			*Panel D*		
Total Citations			*Total Citations Adjusted for Co-authors*			*Average Citations*			*Average Citations Adjusted for Co-authors*		
Rank	*School*	*Total Citations*	*Rank*	*School*	*Total Citations*	*Rank*	*School*	*Average Citations*	*Rank*	*School*	*Average Citations*
1	Stanford	249	1	Stanford	204.50	1	Stanford	41.50	1	Stanford	34.08
2	Chicago	190	2	Chicago	109.67	2	Rochester	17.00	2	Rochester	11.86
3	NYU	157	3	NYU	101.67	3	Chicago	15.83	3	Chicago	9.14
4	Rochester	119	4	Rochester	83.00	4	Cornell	13.33	4	Cornell	7.03
5	Minnesota	96	5	Texas	66.75	5	Carnegie-Mellon	11.25	5	Carnegie-Mellon	6.58
6	Univ. Washington	93	6	Iowa	66.33	6	Iowa	7.33	6	Iowa	5.53
7	Texas	89	7	Minnesota	64.33	7	Pittsburgh	6.10	7	Pittsburgh	3.60
8	Iowa	88	8	Univ. Washington	57.01	8	SUNY at Buffalo	5.70	8	Northwestern	3.42
9	Cornell	80	9	Northwestern	44.49	9	Univ. Washington	5.47	9	Univ. Washington	3.35
10	Northwestern	69	10	British Columbia	43.25	10	Northwestern	5.31	10	Cal-Berkeley	3.28
11	British Columbia	63	11	Cornell	42.16	11	NYU	4.91	11	Minnesota	3.22
12	Pittsburgh	61	12	Pittsburgh	36.00	12	Minnesota	4.80	12	NYU	3.16
13	SUNY at Buffalo	57	13	Illinois	33.83	13	Cal-Berkeley	4.11	13	SUNY at Buffalo	2.98
14	Illinois	48	14	SUNY at Buffalo	29.75	14	Purdue	3.63	14	Purdue	2.94
15	Florida	46	15	Cal-Berkeley	29.50	15	British Columbia	3.50	15	Oregon	2.50
16	Carnegie-Mellon	45	15	Florida	29.50	16	Arizona	3.15	16	British Columbia	2.40
17	Ohio State	44	15	S. Methodist	29.50	17	Texas	2.78	17	S. Methodist	2.11
18	Arizona	41	18	Carnegie-Mellon	26.33	18	S. Methodist	2.57	18	Texas	2.09
19	Cal-Berkeley	37	19	Ohio State	25.74	19	Duke	2.56	19	Arizona	1.62
20	Univ. Pennsylvania	36	20	Purdue	23.50	20	Oregon	2.50	20	Alberta	1.50
20	S. Methodist	36	21	USC	22.50	21	Florida	2.19	21	Florida	1.40
22	USC	31	22	Arizona	21.09	22	Penn State	2.14	22	Duke	1.33
23	Penn State	30	23	Oregon	20.00	23	Univ. Pennsylvania	2.12	23	Missouri	1.27
24	Purdue	29	24	Alberta	19.50	24	Alberta	2.08	24	UCLA	1.24
25	Tel Aviv	28	25	Michigan State	19.00	25	London	1.75	25	Dartmouth	1.21
									25	Illinois	1.21

TABLE 3

EVALUATING ACCOUNTING FACULTIES BY IMPACT OF PUBLICATIONS

Panel A			*Panel B*			*Panel C*		
Percent of Faculty with One Paper Cited Ten or More Times			*Percent of Faculty with Three Papers Cited Five or More Times*			*Percent of Faculty with Five Papers Cited Three or More Times*		
Rank	*School*	*Percentage*	*Rank*	*School*	*Percentage*	*Rank*	*School*	*Percentage*
1	Stanford	.57	1	Stanford	.57	1	Stanford	.43
2	Chicago	.38	2	Cornell	.29	2	Carnegie-Mellon	.40
2	Rochester	.38	3	Rochester	.25	3	Rochester	.25
4	Cornell	.29	4	Chicago	.23	4	Chicago	.23
5	SUNY at Buffalo	.27	5	Carnegie-Mellon	.20	5	Georgia Tech	.20
6	Carnegie-Mellon	.20	5	London	.20	6	Iowa	.15
6	London	.20	7	Iowa	.15	7	Cornell	.14
6	York	.20	8	UCLA	.11	8	UCLA	.11
9	Pittsburgh	.18	9	Dalhousie	.10	9	Dalhousie	.10
10	Univ. Washington	.17	10	Pittsburgh	.09	10	Pittsburgh	.09
10	W. Ontario	.17	11	Northeastern	.08	11	Northeastern	.08
12	British Columbia	.16	12	Denver	.06	12	Northwestern	.07
13	Iowa	.15	12	Michigan	.06	13	Michigan	.06
14	Alberta	.14	12	NYU	.06	13	Denver	.06
14	Minnesota	.14	12	Oklahoma	.06	13	NYU	.06
14	Northwestern	.14	12	Univ. Pennsylvania	.06	13	Univ. Pennsylvania	.06
17	Oregon	.11	12	Texas	.06	17	British Columbia	.05
18	Cal-Berkeley	.10	18	British Columbia	.05	17	Florida	.05
18	Dalhousie	.10	18	Florida	.05	17	Minnesota	.05
18	Ohio Univ.	.10	18	Minnesota	.05	20	Illinois	.03
18	Wyoming	.10	21	All Others	.00	21	All Others	.00
18	Washington St.	.10						
23	NYU	.09						
23	Texas	.09						
25	Boston Univ.	.08						
25	Northeastern	.08						
25	USC	.08						

In viewing Table 4, the effect of coauthor adjustments is quite minimal for graduates. This is due to an averaging of coauthorships over a reduced population of schools (76 as compared to 262 such schools in the faculty evaluation) with, on average, a greater number of graduates than faculty. However, the size adjustment (averaging) does affect a school's ranking (c.f., Panel A with C, or B with D).[14] This latter finding suggests that while many large programs have contributed greatly to accounting research in total, many small programs have produced graduates that contribute, on average, more individually.

In Table 5, the top graduate of each doctoral program was eliminated. Similar to the Table 4 results, the Panel A to B adjustment for coauthors had little effect on the individual graduate rankings, but

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[14] Seven of the top ten schools in Panels A and B are doctoral programs with 50 or more graduates, whereas only three of the top ten schools in Panels C and D have 50 or more graduates.

TABLE 4

EVALUATING ACCOUNTING GRADUATES BY CITATION COUNTS—*JAR, TAR, JAE* AND *AOS*

Panel A			*Panel B*			*Panel C*			*Panel D*		
Total Citations			*Total Citations Adjusted for Co-authors*			*Average Citations*			*Average Citations Adjusted for Co-authors*		
Rank	*School*	*Total Citations*	*Rank*	*School*	*Total Citations*	*Rank*	*School*	*Average Citations*	*Rank*	*School*	*Average Citations*
1	Chicago	1179	1	Chicago	788.41	1	Chicago	25.63	1	Chicago	17.14
2	Illinois	566	2	Illinois	383.17	2	Rochester	17.60	2	Rochester	11.32
3	Stanford	392	3	Stanford	269.67	3	Cornell	17.47	3	Cornell	10.98
4	Texas	368	4	Texas	260.66	4	Carnegie-Mellon	13.73	4	Carnegie-Mellon	9.72
5	Ohio State	349	5	Ohio State	257.41	5	Stanford	9.80	5	Stanford	6.74
6	Cal-Berkeley	318	6	Michigan State	233.49	6	Purdue	8.38	6	Purdue	4.12
7	Michigan State	315	7	Cal-Berkeley	197.49	7	Cal-Berkeley	6.49	7	Cal-Berkeley	4.03
8	Minnesota	271	8	Minnesota	187.58	8	Ohio State	4.31	8	Ohio State	3.18
9	Cornell	262	9	Michigan	167.83	9	Minnesota	4.23	9	Univ. Pennsylvania	3.07
10	Michigan	245	10	Cornell	164.65	10	Univ. Pennsylvania	3.71	10	Minnesota	2.93
11	Carnegie-Mellon	206	11	Carnegie-Mellon	145.38	11	Michigan	3.60	11	Michigan	2.47
12	Univ. Washington	151	12	Univ. Washington	106.49	12	Iowa	3.36	12	Iowa	2.32
13	Northwestern	90	13	Northwestern	67.00	13	Michigan State	2.81	13	Michigan State	2.08
14	Penn State	89	14	Rochester	56.58	14	Maryland	2.62	14	Case Western	2.00
15	Rochester	88	15	Penn State	56.15	15	Illinois	2.44	15	Columbia	1.65
16	Iowa	74	16	Columbia	54.50	16	Texas	2.33	15	Illinois	1.65
17	Wisconsin	70	17	Iowa	51.00	17	Univ. Washington	2.29	15	Texas	1.65
18	NYU	67	18	Wisconsin	49.75	18	SUNY at Buffalo	2.18	18	Univ. Washington	1.61
18	Purdue	67	19	Florida	44.83	19	Penn State	2.07	19	Penn State	1.31
20	Columbia	63	20	NYU	43.16	20	Case Western	2.00	20	Maryland	1.28
21	Florida	57	21	UCLA	34.58	21	Columbia	1.91	21	Northwestern	1.20
22	UCLA	49	22	Purdue	32.99	21	Tennessee	1.91	22	SUNY at Buffalo	1.18
23	Indiana	48	23	N. Carolina	31.33	23	Northwestern	1.61	23	Florida	1.00
24	N. Carolina	42	24	Indiana	29.66	24	Kansas	1.42	24	Tennessee	.95
25	Harvard	39	25	Harvard	25.84	25	MIT	1.28	25	UCLA	.89
						25	Pittsburgh	1.28			

TABLE 5
EVALUATING ACCOUNTING GRADUATES BY CITATION COUNTS—*JAR, TAR, JAE* AND *AOS*
TOP CITED GRADUATE ELIMINATED

Panel A			*Panel B*			*Panel C*			*Panel D*		
Total Citations			*Total Citations Adjusted for Co-authors*			*Average Citations*			*Average Citations Adjusted for Co-authors*		
Rank	*School*	*Total Citations*	*Rank*	*School*	*Total Citations*	*Rank*	*School*	*Total Citations*	*Rank*	*School*	*Total Citations*
1	Chicago	965	1	Chicago	640.74	1	Chicago	21.44	1	Chicago	14.24
2	Illinois	458	2	Illinois	332.67	2	Rochester	11.20	2	Carnegie-Mellon	7.24
3	Stanford	323	3	Ohio State	230.83	3	Carnegie-Mellon	11.07	3	Rochester	7.15
4	Ohio State	302	4	Stanford	201.17	4	Cornell	10.04	4	Cornell	5.67
5	Michigan State	268	5	Michigan State	197.66	5	Stanford	8.08	5	Stanford	5.03
6	Cal-Berkeley	250	6	Cal-Berkeley	160.16	6	Purdue	6.88	6	Cal-Berkeley	3.34
7	Texas	194	7	Texas	131.49	7	Cal-Berkeley	5.21	7	Purdue	3.06
8	Minnesota	186	8	Michigan	123.00	8	Ohio State	3.73	8	Ohio State	2.85
9	Michigan	183	9	Minnesota	107.58	9	Minnesota	2.91	9	Univ. Pennsylvania	2.29
10	Carnegie-Mellon	155	10	Carnegie-Mellon	101.33	10	Univ. Pennsylvania	2.71	10	Michigan	1.81
11	Cornell	149	11	Univ. Washington	91.49	11	Michigan	2.69	11	Michigan State	1.76
12	Univ. Washington	121	12	Cornell	79.32	12	Michigan State	2.39	12	Minnesota	1.68
13	Penn State	63	13	Northwestern	43.50	13	Illinois	1.97	13	Illinois	1.43
14	Northwestern	61	14	Columbia	40.50	14	Univ. Washington	1.83	14	Univ. Washington	1.39
15	Rochester	56	15	Penn State	38.65	15	Columbia	1.53	15	Columbia	1.27
16	Purdue	55	16	Wisconsin	37.75	16	Penn State	1.47	16	Case Western	1.00
17	NYU	52	17	Rochester	35.75	17	Texas	1.22	17	Iowa	.93
18	Columbia	49	18	NYU	33.16	18	Iowa	1.18	18	Penn State	.90
19	Wisconsin	48	19	Florida	29.83	19	Northwestern	1.09	19	Texas	.83
20	Florida	40	20	UCLA	25.25	20	NYU	.96	20	Northwestern	.78
21	Indiana	39	21	Purdue	24.49	21	Kansas	.92	21	Florida	.66
22	UCLA	32	22	N. Carolina	23.83	22	Florida	.89	21	N. Carolina	.66
23	Harvard	31	23	Indiana	21.66	23	UCLA	.84	21	UCLA	.66
24	N. Carolina	27	24	Harvard	20.84	24	SUNY at Buffalo	.82	24	NYU	.61
25	Iowa	26	25	Iowa	20.50	25	Maryland	.77	24	Wisconsin	.61
						25	Wisconsin	.77			

TABLE 6

EVALUATING ACCOUNTING GRADUATES BY IMPACT OF PUBLICATIONS

Panel A			*Panel B*			*Panel C*		
Percent of Graduates with One Paper Cited Ten or More Times			*Percent of Graduates with Three Papers Cited Five or More Times*			*Percent of Graduates with Five Papers Cited Three or More Times*		
Rank	*School*	*Percentage*	*Rank*	*School*	*Percentage*	*Rank*	*School*	*Percentage*
1	Rochester	.60	1	Carnegie-Mellon	.20	1	Carnegie-Mellon	.20
2	Chicago	.30	1	Chicago	.20	2	Chicago	.15
3	Cornell	.27	3	Cornell	.07	3	Cornell	.13
4	Carnegie-Mellon	.20	4	Iowa	.05	4	Iowa	.05
5	Stanford	.15	4	Stanford	.05	4	Stanford	.05
6	Cal-Berkeley	.10	6	Michigan	.04	6	Michigan	.04
7	Iowa	.09	7	Illinois	.03	6	Michigan State	.04
7	SUNY at Buffalo	.09	7	Michigan State	.03	8	Minnesota	.03
9	Arizona	.06	7	Minnesota	.03	9	Cal-Berkeley	.02
9	Minnesota	.06	10	Cal-Berkeley	.02	9	Ohio State	.02
9	MIT	.06	10	Northwestern	.02	11	Illinois	.01
12	Michigan State	.05	10	Ohio State	.02	11	Texas	.01
12	Ohio State	.05	13	Texas	.01	13	All Others	.00
14	Northwestern	.04	14	All Others	.00			
15	Illinois	.03						
15	Michigan	.03						
15	N. Carolina	.03						
15	Univ. Washington	.03						
15	Wisconsin	.03						
20	Penn State	.02						
20	Texas	.02						
22	All Others	.00						

averaging citations benefitted smaller programs. Comparing Panels A and B of Tables 4 and 5, all graduate programs listed are relatively unaffected by the "loss" of their top graduate.

Table 6 appraises graduate programs by breadth of impact in conjunction with "quality" of articles in a manner similar to Table 3 for faculties. This table contains no surprises; all institutions contained in Table 6 appeared in Tables 4 and/or 5.

Logical arguments can be made for all 11 ranking schemes presented above for accounting faculty (Tables 1 through 3) and accounting graduates (Tables 4 through 6). Total citations directly measure the total research impact of a faculty or graduate program. Size-adjusted citations provide a measure of the impact per faculty member or graduate. The percentage of individuals on a faculty or graduates of a doctoral program who publish X (or more) papers cited Y (or more) times provides a measure of the breadth of the research impact. Because all the ranking schemes appear logical, we averaged across the 11 panels of Tables 1-3 (faculties) and Tables 4-6 (graduates).[15] The results appear in Panels A and B of Table 7, respectively. As an indication of the sensitivity of the rankings to the choice of ranking procedure, the table also includes the associated standard deviations of the rankings.

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[15] To obtain the numbers in Panel A of Table 7, the ranks in Panels A and B of Tables 1 and 2 are recomputed, including only institutions with known faculty sizes from the Hasselback book, and then the 11 ranks are

Eighteen of the 22 doctoral-granting institutions listed in Panel A are also included in Panel B, suggesting a strong relationship between a faculty's research impact and that of its graduates. To quantify this perceived relationship, the 76 doctoral-granting institutions in Panel A were ranked separately and compared with the rankings in Panel B. A Spearman rank order test was used to compare the two panels. A correlation coefficient of .784 was obtained, a result significant at the .001 level. This finding is consistent with the evidence of Nikolai and Bazley [1977], who showed that leading accounting departments (defined by "expert" opinion) engage in a substantial degree of cross-hiring.

It can be argued that the "total" impact of an institution upon contemporary accounting research can be measured by the combined contribution of a school's faculty and graduates. With this in mind, we present in Panel C a combined ranking of faculties and doctoral graduates. Again the standard deviation indicates the sensitivity of the institution to alternative ranking schemes.

Several additional observations can be made with regard to institutions. For faculty (Panel A), the top five schools are private, and two of them house one of the four journals from which we collected our citations (i.e., University of Chicago, *Journal of Accounting Research*; University of Rochester, *Journal of Accounting and Economics*). These five schools accounted for 17.7 percent of the total citations in our data base (262 institutions were represented in the data base). Of the remaining 20 schools, six are "Big Ten" institutions and five are "Pac Ten" schools. "Big Ten" and "Pac Ten" schools (less Stanford) accounted for an additional 10.6 percent and 6.5 percent of total citations, respectively. For graduates (Panel B), the top four schools are private and nine of the remaining 21 schools are "Big Ten" institutions. Graduates of the top four private schools and "Big Ten" institutions accounted for approximately 57.2 percent of the 4,948 citations in our data base (27.7 percent and 29.5 percent, respectively). These two groups accounted for 70.4 percent of all citations generated by graduates of the 76 doctoral-granting institutions (34.1 percent and 36.3 percent, respectively). In the overall ranking (Panel C), the top five schools are private and eight of the remaining 20 institutions are "Big Ten" schools.[16]

Brown and Gardner [1985] have shown that contemporary accounting research as we defined it (main articles published in the aforementioned four accounting research journals between 1976 and 1982) cites many papers published prior to 1976. While pre-1976 research remains influential, it is useful to evaluate faculty and graduates based upon citations by the four citing journals between 1976 and 1982 to journal articles published by accountants during the same time period.[17] Table 8 provides average rankings based on citations to papers published after

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averaged. Similarly, Panels A and B of Tables 4 and 5 are adjusted to reflect only the schools for which the 1983 Hasselback book includes the total number of the institution's doctoral program graduates before the averages in Panel B of Table 7 are calculated.

[16] To calculate the numbers in Panel C of Table 7, the Panel A numbers were recomputed based solely upon institutions with a known number of graduates, and these rankings were averaged with those appearing in Panel B.

[17] This approach has the advantage of providing a more up-to-date measure of faculty/graduate research impact, but it has the disadvantage of not measuring the total impact of a faculty/graduate program on contemporary accounting research.

TABLE 7

AVERAGE RANKINGS OF ACCOUNTING FACULTY AND GRADUATES

Panel A				*Panel B*				*Panel C*			
Accounting Faculty				*Accounting Graduates*				*Accounting Faculty/Graduates*			
Rank	*School*	*Average Rank*	*Standard Deviation*	*Rank*	*School*	*Average Rank*	*Standard Deviation*	*Rank*	*School*	*Average Rank*	*Standard Deviation*
1	Stanford	1.00	0.00	1	Chicago	1.18	0.40	1	Chicago	2.14	1.75
2	Rochester	2.82	0.75	2	Stanford	4.18	0.87	2	Stanford	2.59	2.52
3	Chicago	3.09	0.94	3	Carnegie-Mellon	5.55	5.23	3	Rochester	5.86	8.12
4	Cornell	6.27	2.90	4	Cornell	5.91	3.72	4	Carnegie-Mellon	6.00	6.28
5	Carnegie-Mellon	6.73	5.31	5	Cal-Berkeley	7.00	1.34	4	Cornell	6.00	4.63
6	Iowa	7.55	2.07	6	Ohio State	7.27	2.72	6	Minnesota	9.45	3.54
7	NYU	9.55	6.22	7	Illinois	8.73	5.78	7	Iowa	10.64	9.12
8	Pittsburgh	10.91	3.05	8	Michigan State	8.82	3.34	8	Cal-Berkeley	10.86	6.70
9	Minnesota	11.27	4.41	8	Minnesota	8.82	1.33	9	Univ. Washington	12.59	4.70
10	Northwestern	12.09	3.51	10	Rochester	8.91	6.70	10	Texas	12.69	8.15
11	Univ. Washington	12.82	5.46	11	Michigan	9.64	2.54	11	Northwestern	13.18	5.56
12	British Columbia	14.82	3.49	12	Texas	11.91	5.70	12	Illinois	13.86	10.95
13	SUNY at Buffalo	15.00	5.44	13	Purdue	13.73	6.63	13	Michigan	14.05	9.87
14	Univ. Pennsylvania	16.09	10.26	13	Univ. Washington	13.73	2.00	13	NYU	14.05	10.97
15	Texas	16.55	8.58	15	Iowa	14.18	7.27	15	Ohio State	15.50	14.41
16	Cal-Berkeley	16.64	4.18	16	Northwestern	15.45	3.83	16	Univ. Pennsylvania	15.73	12.10
17	Florida	20.09	6.19	17	Penn State	15.82	2.40	17	Michigan State	16.32	12.53
18	Arizona	21.73	3.52	18	Columbia	16.45	3.05	18	Purdue	16.59	9.16
19	Michigan	21.82	8.57	19	Univ. Pennsylvania	17.91	8.41	19	Pittsburgh	17.73	13.81
20	S. Methodist	22.00	6.42	20	Wisconsin	19.73	5.75	20	SUNY at Buffalo	18.14	12.20
20	UCLA	22.00	13.18	21	Florida	19.82	3.68	21	Florida	18.18	5.74
22	Oregon	22.73	5.59	22	NYU	20.00	4.82	22	UCLA	19.77	11.81
23	Purdue	23.18	7.44	23	UCLA	20.73	4.08	23	Penn State	20.32	9.62
24	Alberta	23.45	4.34	24	N. Carolina	21.55	5.50	24	Columbia	20.82	8.74
25	Illinois	24.64	10.16	25	Maryland	22.82	6.87	25	N. Carolina	23.82	8.63

TABLE 8
AVERAGE RANKINGS OF ACCOUNTING FACULTY AND GRADUATES
POST 1975 PUBLICATIONS

Panel A				Panel B				Panel C			
Accounting Faculty				Accounting Graduates				Accounting Faculty/Graduates			
Rank	*School*	*Average Rank*	*Standard Deviation*	*Rank*	*School*	*Average Rank*	*Standard Deviation*	*Rank*	*School*	*Average Rank*	*Standard Deviation*
1	Stanford	1.18	0.40	1	Chicago	2.45	1.13	1	Chicago	3.00	1.73
2	Rochester	2.18	0.87	2	Cornell	4.64	2.80	1	Stanford	3.00	3.19
3	Chicago	3.55	1.04	3	Stanford	4.82	1.66	3	Rochester	3.73	5.33
4	Cornell	4.91	2.63	4	Rochester	5.27	4.73	4	Cornell	4.73	3.69
5	Iowa	5.91	2.39	5	Carnegie-Mellon	5.45	3.24	5	Minnesota	7.14	3.70
6	Pittsburgh	6.09	1.58	6	Ohio State	5.64	2.77	6	Cal-Berkeley	7.64	4.28
7	Minnesota	6.27	2.65	7	Cal-Berkeley	6.09	1.14	7	Carnegie-Mellon	10.59	12.14
8	SUNY at Buffalo	8.82	3.92	8	Illinois	6.73	5.12	8	Univ. Washington	11.45	8.35
9	Univ. Washington	9.64	4.11	9	Minnesota	8.27	2.41	9	Texas	11.59	9.36
10	Cal-Berkeley	9.73	3.82	10	Texas	9.27	5.78	10	Iowa	11.82	15.25
11	British Columbia	10.55	4.50	11	Michigan State	10.18	4.75	11	Illinois	12.41	12.54
12	Northwestern	11.00	3.44	12	Purdue	11.55	6.68	12	Purdue	12.59	8.67
13	NYU	12.36	7.84	13	Michigan	13.55	5.54	13	Northwestern	12.64	8.30
14	Purdue	14.64	5.97	14	Univ. Washington	13.73	6.77	13	Pittsburgh	12.64	12.65
15	Oregon	15.00	7.04	15	UCLA	14.55	5.79	15	SUNY at Buffalo	13.45	14.21
16	Univ. Pennsylvania	15.09	7.09	16	Northwestern	15.00	6.87	16	Ohio State	13.64	15.64
17	Arizona	15.91	6.28	17	Columbia	15.64	6.23	17	NYU	14.45	11.36
18	Texas	16.45	9.16	18	Penn State	16.00	6.68	18	Michigan	14.64	9.45
19	Florida	16.55	7.10	19	NYU	17.82	8.02	19	UCLA	15.68	9.19
20	Carnegie-Mellon	17.82	10.94	20	Iowa	17.91	12.14	20	Florida	17.23	11.13
21	Michigan	17.91	9.28	21	Kansas	18.45	9.14	21	Penn State	17.27	10.16
22	UCLA	19.00	8.32	21	SUNY at Buffalo	18.45	11.60	22	Columbia	18.14	11.29
23	S. Methodist	19.27	7.72	23	Pittsburgh	19.18	7.95	23	Michigan State	19.14	19.12
24	Alberta	20.00	9.67	24	Tennessee	19.45	9.50	24	Arizona	20.73	21.89
25	Duke	20.18	9.52	25	Florida	20.00	8.79	25	Oregon	21.00	18.25

TABLE 9
RESEARCHERS CITED MOST OFTEN BY *CAR*

Panel A		*Panel B*	
Total Citations to All Articles		*Total Citations to Articles Published 1976–1982*	
Name	*Faculty/Graduate/Year*	*Name*	*Faculty/Graduate/Year*
Abdel-khalik, A. R.	Florida/Illinois/72	Albrecht, W. S	Brig. Yg./Wisconsin/75
Ashton, R. H.	NYU/Minnesota/73	Ashton, R. H.	NYU/Minnesota/73
Ball, R. J.	Australia G./Chicago/72	Beaver, W. H.	Stanford/Chicago/65
Beaver, W. H.	Stanford/Chicago/65	Birnberg, J. G.	Pittsburgh/Minnesota/62
Benston, G. J.	Rochester/Chicago/63	Brown, L. D.	SUNY at Buffalo/Rochester/75
Brown, P. R.	W. Australia/Chicago/68	Collins, D. W.	Iowa/Iowa/73
Collins, D. W.	Iowa/Iowa/73	Demski, J. S.	Stanford/Chicago/67
Copeland, R. M.	N'Eastern/Mich. State/66	Dopuch, N.	Chicago/Illinois/61
Davidson, S.	Chicago/Michigan/50	Dyckman, T. R.	Cornell/Michigan/60
Demski, J. S.	Stanford/Chicago/67	Foster, G. J.	Stanford/Stanford/75
Dopuch, N.	Chicago/Illinois/61	Gonedes, N. J.	U. Pennsylvania/Texas/69
Dyckman, T. R.	Cornell/Michigan/60	Griffin, P. A.	Cal-Davis/Ohio State/74
Flamholtz, E. G.	UCLA/Michigan/69	Joyce, E. J.	Minnesota/Illinois/76
Foster, G. J.	Stanford/Stanford/75	Leftwich, R. W.	Chicago/Rochester/80
Gonedes, N. J.	U. Pennsylvania/Texas/69	Lewis, G. L.	Pittsburgh/Penn State/78
Kaplan, R. S.	Carnegie/Cornell/68	Libby, R.	Michigan/Illinois/74
Lev, B.	Tel Aviv/Chicago/68	Lookabill, L. L.	Oregon/Stanford/75
Libby, R.	Michigan/Illinois/74	McKeown, J. C.	Illinois/Mich. State/69
Mock, T. J.	USC/Cal-Berkeley/64	Patell, J. M.	Stanford/Carnegie/77
Ronen, J.	NYU/Stanford/70	Penman, S. H.	Cal-Berkeley/Chicago/77
Sorensen, J. E.	Denver/Ohio State/65	Sunder, S.	Minnesota/Carnegie/73
Sunder, S.	Minnesota/Carnegie/73	Swieringa, R. J.	Cornell/Illinois/69
Watts, R. L.	Rochester/Chicago/71	Watts, R. L.	Rochester/Chicago/71
Weil, R. L.	Chicago/Carnegie/66	Wright, W. F.	Minnesota/Cal-Berkeley/75
Zimmerman, J. L.	Rochester/Cal-Berkeley/74	Zimmerman, J. L.	Rochester/Cal-Berkeley/74

1975 in a manner similar to that of Table 7. In comparing Table 8 to Table 7, substantial ranking changes are observed.

6. EVALUATING INDIVIDUALS

Table 9 presents alphabetically the names and selected attributes of those individuals who have been cited most often by contemporary accounting research. Information provided includes the individual's 1982–83 permanent institutional affiliation, degree-granting institution, and year of graduation. Panel A lists alphabetically the 25 individuals cited most often by CAR. While these individuals have published articles with the greatest total impact over the 1976 through 1982 period, the list is biased towards individuals who graduated and published prior to 1976. In an effort to provide a more up-to-date measure of faculty/graduate research impact, Panel B includes only citations to articles published during the CAR (1976 to 1982) period.

7. SUMMARY AND LIMITATIONS

Citation analysis has been used extensively in other disciplines, but only rarely in the accounting discipline (i.e., McRae [1974]; Dyckman and Zeff [1984]; Brown and Gardner [1985]). While the technique has numerous limitations, it has performed well in validation studies and is considered by many to be a useful way of evaluating academic research. With regard to our particular data base, several *caveats* pertain. First, we confined all citations to refereed articles, and excluded references to books, monographs, conference proceedings, and working papers. As these are all potentially influential research endeavors, our results may not be generalizable to all cited accounting research. Second, we collected citations *from* only four journals over a limited time period (1976–82). Although the journals we selected were major accounting research outlets [Howard and Nikolai, 1983], many researchers in specialized areas (e.g., tax, MIS) target their works to other, more highly specialized journals. Third, the number of accounting graduates from an institution was defined according to the first page of Hasselback's *Accounting Faculty Directory 1983*. Since many accounting academics who graduated from one of the 76 institutions granting terminal degrees were not *accounting* graduates according to this definition, this procedure may have resulted in a slight misspecification of the rankings based on citations per graduate. Fourth, we chose a limited number of dimensions over which to evaluate faculties, graduates, and individuals. Other dimensions such as percent of faculty or graduates cited at least once could have been considered. Fifth, our method attributes all citations to an individual's 1982–83 institution. Alternatively, we could have attributed a researcher's impact to the institution he/she was affiliated with when the paper was published or submitted. Thus, the reader needs to consider these limitations when deciding to what extent our method is useful for evaluating institutions and individuals.

We do not advocate that citation analysis be used as a substitute for peer judgment. However, we believe that the technique can serve as a useful adjunct to peer review. Similarly, we do not recommend that the procedure be used to compare individuals across disciplines, as citation rates depend upon such discipline-specific factors as the size of the core literature, its degree of integration, and its age [Garfield, 1979]. Nevertheless, the procedure can be employed cautiously to evaluate contributions of research contemporaries in particular disciplines. Finally, we recognize that citation analysis may have undesirable consequences if it is used to evaluate researchers. As examples, manuscript reviewers may be more favorably disposed towards papers which cite their articles and authors may cite their friends more often [May, 1967]. As with any evaluation technique, one must proceed with caution when using citation analysis for evaluative purposes.

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THE ACCOUNTING REVIEW
Vol. LX, No. 2
April 1985

Perceived Risk, Market Risk, and Accounting Determined Risk Measures

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ABSTRACT: This paper investigates the issue of whether financial reports appear to convey, at least in an implicit fashion, information on risk. The paper extends previous analyses by using the risk perceptions of a representative group of financial analysts as surrogates for *ex ante* risk. Our findings indicate that the seven accounting measures of risk used in the study "explain" approximately 79 percent of the variation in the average risk perceptions of the financial analysts surveyed. Tests were also performed which support the use of the analysts' risk perception measure as a proxy for a stock's "true" market risk.

INTRODUCTION

If corporate financial reporting is to be adequately supportive of investment decision making, then clearly it must provide information useful to the formation of risk and return assessments. Whether this is in fact the case, however, has been the subject of considerable interest and speculation. While the earnings figures in traditional financial reports may provide information to assist investors in arriving at a "best guess" estimate of future return, they may not necessarily provide information to assist investors in estimating the degree of variability of the return.

Bowman [1982, p. 34] raises the dilemma that:

> though risk is a concept relevant before the occasion (i.e., *ex-ante*), it essentially must be measured in actual empirical work after the occasion (i.e., *ex-post*).

This paper presents the results of a study which approached this dilemma in a unique way. In this study, we use the risk perceptions of a representative sample of financial analysts as the focal point of our analysis. The data were collected for 25 stocks as of May 1982, and served as measures of *ex ante* risk. These risk perceptions were then analyzed as a function of selected accounting variables; the variables were found to explain 79 percent of the variation in risk perception, indicating that financial reports do seem to provide implicit evidence on the perceived riskiness of corporate stocks. Also, in explaining expected return as well as return actually realized, the risk perception measure was found to perform quite well as a risk proxy.

The authors wish to acknowledge the instructive comments of the Editor, an Associate Editor, and two anonymous reviewers on earlier drafts of this paper.

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Manuscript received August 1983.
Revisions received March and August 1984.
Accepted October 1984.

THE ISSUE

There appears to be agreement in the financial community that risk is important and that investors are averse to risk; beyond this, however, there is little consensus on the topic. As Blume [1971, p. 1] observes:

> The concept of risk has so permeated the financial community that no one needs to be convinced of the necessity of including risk in investment analysis. Still of controversy is what constitutes risk and how it should be measured.

"What constitutes risk and how it should be measured" is extremely elusive. If it is agreed that risk is of concern to the financial community, then it can be argued that financial reporting should provide information which aids individuals in assessing risk. This is a difficult task since there is no agreement on what risk is. This dilemma is partly solved by the fact that although there is no one specific definition of risk which is totally acceptable to the financial community, there is, as Lorie and Hamilton [1973, p. 114] point out, general agreement that risk is associated with the degree of unpredictability of future returns. Thus it would seem that although financial reporting cannot define risk for all investors nor tell them how to measure it, it might assist investors by providing data useful in assessing the predictability of future returns.

The quality of the assistance provided by accounting data for users attempting to assess risk is subject to question. Ronen and Sorter [1972], for example, criticize accounting information by suggesting that it does not *explicitly* deal with considerations of risk. Ronen [1977, p. 14] observes that this lack of attention is unfortunate, because:

> the entire burden of assessing uncertain prospects falls on the user. But companies and management are the very ones —sometimes the only ones—who can make proper assessments of uncertainties relevant to their own future prospects.

This does not necessarily mean, however, that accounting is not supportive of the risk/return tradeoff that investors must make. Accounting data may supply assistance for risk assessment in an *implicit,* rather than an explicit, manner. The work of Beaver, Kettler and Scholes [1970], Eskew [1979], and Elgers [1980] suggests that this is in fact the case. These authors concluded that accounting-determined measures of risk were indeed impounded in market price-based risk measures; however, this conclusion was based on analyses using beta or Bayesian-adjusted beta and may be sensitive to problems associated with this traditional risk measure (e.g., see Roll [1977], Banz [1981], and Basu [1977]).

We also investigate the relationship between market risk and accounting risk; however, unlike these previous studies, we do not use the traditional market-determined *ex post* measure of beta as a surrogate for risk. Rather, we use a measure of risk that is totally forward-looking, namely the risk perceptions of a representative sample of financial analysts. In choosing to measure the concept of *ex ante* risk empirically, we have used a research method which is quite different from traditional approaches.

RESEARCH METHOD

Data

Marketwide data on risk that is truly *ex ante* are unavailable. Since we were unwilling to settle for *ex post* data on risk, we made the compromise of using *ex ante* data (risk perceptions) that are not marketwide, although they appear to be representative of the market.

In May 1982, a list of 25 widely-held

and widely-recognized stocks was sent to a random sample of 500 members of the Financial Analysts Federation (FAF). Recipients of the questionnaire were requested to assess the risk of each of the 25 companies on a scale of 1 (low) to 9 (high), assuming that the stock was to be added to a diversified portfolio. Thus, an assessment of perceived market (systematic) risk was the objective. Only the names of the companies were mentioned, and no financial or other information was included in the survey instrument. An attempt was made to include stocks representing a variety of industries and with which the respondents would likely be familiar. This research design (i.e., the use of a questionnaire to examine directly the concept of risk) is similar to that used by McDonald and Stehle [1975].[1]

Two hundred and nine responses (42 percent) were received within two weeks of the initial mailing. Another 25 responses (five percent) were received after that time period but were not included in the analysis.[2] The attained response rate of 42 percent is at the higher end of the modal range of the 20 to 40 percent response rate normally expected for mailed questionnaires [Kerlinger, 1973]. A response rate of 40 percent is generally considered adequate for the analysis and reporting of surveys [Babbie, 1979].

Accounting data were also collected from the annual reports of the 25 companies for the period 1977-1981. Data were collected for the accounting-determined measures of risk used in the Beaver, Kettler and Scholes [1970] study: dividend pay-out, asset growth, leverage, liquidity, asset size, variability of earnings, and covariability of earnings. (See the Appendix for definitions of these variables.) As pointed out by Beaver, Kettler and Scholes [1970, p. 660], these variables "capture most of the important relationships suggested in the literature." With the exception of asset growth, variability in earnings, and covariability in earnings, which were computed over a five-year period, the study variables were computed using 1981 year-end data. Summary data for the accounting variables are presented in Table 1.

To assess the reasonableness of using analysts' risk perception as a risk surrogate, we collected additional data enabling us to compare the performance of the risk perception measure to that of beta. Value Line's beta was obtained as of May 1982, and a second beta was computed for the period May 1982 through May 1983. We also collected data on Value Line's expected return as of May 1982, using this as a proxy for the market's expected return as of that date.

The temporal relationship of the data is summarized in Figure 1. The focal point of the design is the analysts' risk perceptions, which link the past (before May 1982) with the future (May 1982 to May 1983).

Analysis

Several analyses were undertaken. First, to assess the relationship between average risk perceptions and the accounting risk indicators, the mean risk assessment of the 209 financial analysts was regressed (using pairwise deletion of missing data) on the accounting-determined measures of risk.

Second, to investigate whether the relationships observed with respect to the

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[1] In a survey conducted in 1973, McDonald and Stehle [1975] asked institutional investors to assess the perceived risk, on a scale of 1 to 9, of 25 common stocks. The results showed that historical beta and unsystematic risk explained 83 percent of the variance in perceived risk among the 25 stocks.

[2] Consistent with the approach of McDonald and Stehle [1975], a two-week response period was thought to provide a reasonable, common time frame. Since it is likely that risk perceptions change rapidly, a rather short response period seemed essential.

TABLE 1

SUMMARY DATA FOR SELECT STUDY VARIABLES*

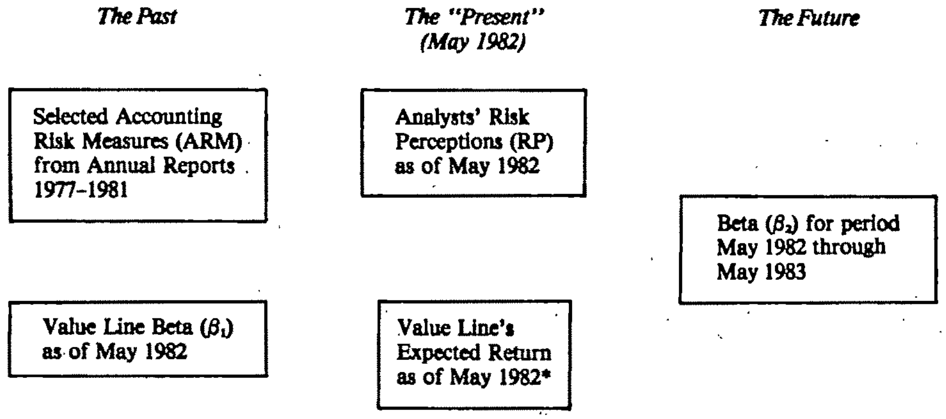
Name of Stock	*Dividend Pay-out*	*Current Ratio*	*Asset Size*	*Asset Growth*	*Leverage*	*Variability in Earnings*	*Co-variability in Earnings*	*Perceived Risk*	
								Mean	*Variance*
American Telephone	0.63	0.70	11.83	0.093	0.165	1.09	0.62	1.89	1.22
Procter & Gamble	0.47	1.76	8.85	0.106	0.318	2.79	0.46	2.36	1.74
IBM	0.61	1.41	10.30	0.103	0.338	1.95	0.21	2.39	1.52
General Electric	0.43	1.24	9.95	0.111	0.468	1.29	0.97	2.69	1.64
Exxon	0.47	1.34	11.33	0.165	0.277	2.25	0.56	2.70	1.97
Commonwealth Edison	0.88	0.72	9.32	0.128	0.620	1.76	0.21	3.20	2.40
Dow Jones & Co.	0.40	0.78	6.28	0.177	0.477	2.96	0.67	3.57	2.38
McDonalds	0.15	0.50	7.97	0.150	0.413	2.32	0.62	3.87	2.36
Sears Roebuck	0.66	1.24	10.24	0.177	0.573	1.42	0.67	3.91	1.69
DuPont	0.60	2.05	10.08	0.244	0.508	1.64	0.67	4.11	1.91
Safeway	0.59	1.08	8.21	0.093	0.691	2.01	0.55	4.28	3.27
Citicorp	0.36	—	11.69	0.124	—	1.52	0.87	4.30	2.37
Dr. Pepper	0.54	2.17	5.11	0.121	0.215	2.26	0.31	4.32	2.03
General Motors	2.24	1.09	10.57	0.093	0.422	—	0.32	4.59	2.43
Xerox	0.42	1.74	8.95	0.102	0.397	1.04	0.21	4.69	2.45
American Broadcasting	0.31	2.63	7.37	0.127	0.370	0.47	0.16	4.86	1.83
Holiday Inns	0.20	0.87	7.43	0.155	0.536	1.34	0.36	5.13	1.86
Tandy	0.00	3.48	6.84	0.168	0.225	3.27	0.31	5.54	2.00
Litton Industries	0.17	1.53	8.21	0.117	0.552	2.52	1.00	5.66	1.78
RCA	—	1.18	8.97	0.143	0.855	—	—	5.67	2.02
Georgia Pacific	0.80	1.48	8.53	0.134	0.450	3.13	0.67	5.88	2.51
Emery Air Freight	0.83	1.78	5.62	—	0.697	2.28	0.46	5.92	2.58
E. F. Hutton	0.18	—	8.64	0.181	—	1.80	0.82	6.37	2.75
U. S. Homes	1.30	—	6.63	0.136	—	20.18	0.10	7.23	2.60
International Harvester	—	1.48	8.58	0.081	0.704	—	—	8.78	0.41

* A blank indicates that data either were not available or were not meaningful.

average risk perception held true for individual perceptions, Kendall's coefficient of concordance [Hollander and Wolfe, 1972] was computed. For each of the 209 financial analysts, pair-wise correlation with each of the seven accounting risk indicators was computed and the resulting correlations (absolute value) were used to assign ranks. Thus, the accounting risk measure which correlated the highest in absolute value with the individual respondent's ratings received the rank of 1; the second highest correlated received the rank of 2, etc. Therefore, a matrix of 209×7 was developed. Kendall's coefficient of concordance was then used to test the null hypothesis that there was no significant difference or concordance between the seven accounting measures as they relate to the 209 respondent ratings. A multiple comparison's test based on Friedman rank sums was undertaken to allow the accounting risk measures to be ordered and tested for significant difference.

Third, to assess the reasonableness of using analysts' risk perceptions as a surrogate for market risk, two procedures were employed. Since the *ex ante* market risk cannot, of course, be measured, our tests of the quality of the survey data were necessarily indirect. The first procedure used was based on the fundamental notion from financial theory that a security's market risk should be linearly related to its expected return. Hence,

FIGURE 1
TEMPORAL RELATIONSHIP OF DATA


The Past
The "Present" (May 1982)
The Future
Selected Accounting Risk Measures (ARM) from Annual Reports 1977–1981
Analysts' Risk Perceptions (RP) as of May 1982
Beta (β₂) for period May 1982 through May 1983
Value Line Beta (β₁) as of May 1982
Value Line's Expected Return as of May 1982*

* More specifically, this is the midpoint of Value Line's three-to-five-year, high-low, projected annual total return—that is, the expected return predicted as of May 1982. This served as a proxy for the market's expected return as of that date.

using a procedure proposed by Farrelly and Reichenstein [1984], the correlation between a firm's expected return and the Value Line beta, β_1, and between its expected return and the analysts' risk perceptions (RP) were compared. A finding that the correlation between RP and expected return was equal to or greater than the correlation between β_1 and expected return would provide some evidence of the adequacy of RP as a surrogate for market risk. A second indirect test involved the comparison of the correlations between β_2 and RP and between β_2 and β_1. Both RP and β_1 may be viewed as forecasts of future risk, and a finding that the correlation between RP and β_2 was equal to or greater than the correlation between β_1 and β_2 would provide some evidence of the adequacy of RP as a predictor of future variability.

Finally, to enable an assessment of the sensitivity of regression estimates to alternative measures of market risk, a regression of β_1 on the accounting risk measures was performed. This allowed us to compare the regression results using RP with those using β_1.

RESULTS AND DISCUSSION

Accounting Risk Measures and Analysts' Risk Perceptions

The first row of Table 2 presents the results of the regression of the average risk perceptions of our sample of analysts on the accounting-determined measures of risk. These results indicate significance at the 0.05 level for three accounting-determined measures of risk: current ratio, leverage, and variability in earnings.[3] The total "explained" variation was 0.79 (adjusted r-squared$=0.66$; $F=5.934$, $p<.005$), of which 0.59 was attributable

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[3] As anticipated, the coefficients for leverage and variability in earnings were positive, whereas contrary to traditional thinking, the coefficient for the current ratio was also positive. This latter result may be an artifact of our sample, which consists of many of the nation's financially strongest firms—firms which tend to maintain lower levels of liquid assets because of their quick accessibility to bank lines of credit and the commercial paper market to satisfy their liquidity needs.

TABLE 2
REGRESSION ANALYSIS RESULTS*
($n=25$)

Dependent Variable	Independent Variables									
	Dividend Pay-out	Current Ratio	Asset Size	Asset Growth	Leverage	Variability in Earnings	Co-variability in Earnings	R^2	Adjusted R^2	F Value
RP	−1.59	1.02	0.09	−7.64	7.09	0.31	−0.74	0.79	0.66	5.93
	(.079)	(0.024)	(.629)	(.263)	(.001)	(.006)	(0.395)			(.005)
β_1	−0.54	0.18	0.05	0.70	0.51	0.09	−0.11	0.74	0.57	4.42
	(.005)	(.031)	(.174)	(.582)	(.107)	(.002)	(.497)			(.014)

* Significance levels are presented in parentheses below the regression coefficients.

TABLE 3

CORRELATION MATRIX FOR PERCEIVED RISK AND SELECTED ACCOUNTING VARIABLES

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
Dividend Pay-out (X_1)	—	−.09	.12	−.25	.06	.65*	−.23	.14
Current Ratio (X_2)		—	−.37	.18	−.31	.14	−.16	.29
Asset Size (X_3)			—	−.10	−.13	−.30	.33	−.46*
Asset Growth (X_4)				—	.03	.01	.13	.01
Leverage (X_5)					—	−.06	.25	.52*
Variability in Earnings (X_6)						—	−.23	.48*
Covariability in Earnings (X_7)							—	−.08
Perceived Risk (X_8)								—

* $p<.01$

to the three significant variables. These results provide support for the notion that financial reports do provide implicit evidence regarding the perceived riskiness of corporate stocks.[4] This finding is particularly compelling since our accounting measures were based on the most recent *annual* performance data and not the most recent performance data (i.e., first quarter performance).[5]

To investigate the extent to which multicollinearity existed among the independent (accounting) variables, each of the independent variables (X_i, $i=1, \ldots, 7$) was regressed on the remaining set of independent variables (X_j, $j \neq i$). If multicollinearity is severe, the r-squared from these regressions should be high (e.g., r-squared$\geq .9$). For the current data set, the highest unadjusted r-squared obtained was 0.69, which indicates that while some correlation exists among the independent variables, multicollinearity was not a serious problem. This result accords with the simple correlation coefficients reported in Table 3.

Finally, to investigate for the presence of a significant fitting bias induced by using the mean risk preference of the 209 analysts, the regression analysis was rerun using disaggregated data (i.e., 209 observations per firm). This analysis produced an adjusted r-squared of 0.41 ($F=387.730$, $p<.000$) and highly consistent coefficient values.[6]

In the second analysis, designed to investigate individual risk perceptions, Kendall's coefficient of concordance produced a value $W=0.513$, which was significant at $p<.001$; this result indicates that there was considerable agreement among the respondents on the relative importance of at least some of the seven accounting risk indicators in assess-

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[4] To investigate the impact of extreme cases on our regression results, the analysis was re-run excluding data for International Harvester, which was experiencing significant financial difficulties during the period of analysis. With IH excluded from the sample, an r-squared of 0.74 was obtained (adjusted r-squared$=0.57$; $F=4.45$, $p<.01$). Consistent with the original regression results presented in Table 2, the coefficients for current ratio, leverage, and earnings variability were again both positive and significant ($p<.05$).

[5] We thought it inappropriate to use quarterly data in that the use of quarterly data "raises some important problems associated with seasonality" [Foster, 1978, p. 285]. For a detailing of various specification issues which need to be addressed when quarterly data are used, see Griffin [1976].

[6] Given the large number of replicates for each firm (i.e., 209), it is important to examine the appropriateness of the multiple linear model. A "lack of fit" test was undertaken, which produced a mean square lack of fit of 234.969 ($F=114.04$); hence, the linear model was found to inadequately describe the data set, suggesting that the true model may be a higher order polynomial or other non-linear model.

FIGURE 2
RESULTS OF MULTIPLE COMPARISONS TEST

Leverage	*Variability of Earnings*	*Asset Size*	*Current Ratio*	*Dividend Pay-out*	*Co-variability of Earnings*	*Growth in Total Assets*
(458)	(538)	(555)	(847)	(1030)	(1198)	(1223)

ing a firm's risk. The multiple comparisons test based on Friedman rank sums produced the results in Figure 2. Each of the four groups indicates those measures which are not significantly different; for example, leverage, variability of earnings, and asset size are not significantly different. The number in parentheses indicates the sum of the ranks assigned to each risk measure. For example, if the risk perceptions of each of the 209 respondents correlated most closely with leverage, then the sum of the ranks for leverage would be 209. Thus, *greater* (explicit or implicit) use of a risk measure is indicated by a *lower* rank.

Leverage, variability in earnings, and asset size were most consistently correlated with the respondents' risk ratings. With the exception of asset size, these relationships are consistent with the multiple regression analysis.[7] With respect to the covariability of earnings and growth in total assets, a significant correlation coefficient was observed in only 13 and six cases, respectively, out of a total of 209. Thus, it appears that these two accounting variables had little impact on the formation of individual risk perceptions.

In summary, our findings provide evidence suggesting a relationship between accounting risk measures and both the individual and average risk perceptions of financial analysts; they indicate that financial reports do convey, at least in an implicit fashion, information on the perceived riskiness of corporate stocks.

Analysts' Risk Perceptions as a Proxy for Market Risk

To investigate the reasonableness of using analysts' risk perceptions as a proxy for market risk, two analyses were undertaken. First, reasoning that security risk should be correlated with expected return, we sought to compare how the analysts' risk perceptions correlated with expected return versus how beta (β_1) correlated with expected return. Using the midpoint of Value Line's three-to-five-year, high-low, projected annual total return (that is, the expected return predicted as of May 1982) as a proxy for the market's expected return as of May 1982, the correlation between expected return and RP was found to be 0.71 while the correlation between expected return and Value Line's beta was an insignificant 0.20.[8] One may question whether the expected return measure is representative of the market's earnings expectations; however, the strong performance of the analysts' risk perceptions (RP), especially against Value Line's own betas, must be viewed as support for the use of the survey data as a proxy for market risk.

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[7] Asset size was negatively correlated with perceived risk. Similarly, size was also negatively correlated with current ratio (−0.37) and earnings variability (−0.30), both of which were consistently significant in the market risk multiple regression. It is thus possible that asset size is not important in and of itself, but rather serves as a proxy for other variables of importance.

[8] Removing International Harvester from the sample, the correlations change to 0.53 and 0.32, respectively.

The second procedure used to test indirectly the reasonableness of RP was a comparison of the correlations between β_2 and RP and between β_2 and β_1. This method implicitly assumes that the betas are stable and that the ultimate test of the use of a risk measure would appear to be how well the measure can predict future variability. The correlation between β_2 and the survey data was 0.79, which is virtually identical to the 0.78 correlation observed between β_2 and β_1. Thus, the risk perception measure was found to perform as well as historic beta in predicting future beta.

In summation, the mean risk perception of the survey respondents appears to be a reasonable proxy for *ex ante* market risk. It "explains" expected return better than beta and it predicts future variability just as well as beta—as shown by an after-the-fact comparison.

Risk Perception versus Beta

Although risk perception is the focal point of our study, we also provide the results of the regression of beta on the accounting-determined measures of risk (see Table 2). This allows us to compare the regression results using RP to those using β_1.

Risk perception and beta are two quite different measures of market risk, yet each impounds the accounting risk measures to a certain extent (adjusted r-squared of 0.66 and 0.57, respectively). Although both regressions contain three significant accounting variables, differences among the variables exist. While the current ratio and variability in earnings are significant in both regressions, leverage is the third significant variable in the RP regression and dividend pay-out in the β_1 regression.

This evidence is similar to that provided in previous studies [Beaver, Kettler and Scholes, 1970; Eskew, 1979; and Elgers, 1980]. These studies show that accounting risk measures are impounded in market-based risk measures, but provide different findings regarding which accounting risk measures are significant. For example, Beaver, Kettler and Scholes, Elgers, and we found the dividend pay-out ratio to be significant in β_1 regressions; Eskew did not, and as previously noted, this variable was not significant in the RP regression.[9] Finally, the insignificance of leverage in the β_1 regression, and in similar regressions from previous studies, runs counter to financial theory (e.g., Hamada [1972]) which predicts that beta is a function of both financial risk (surrogated by leverage) and business risk (surrogated by earnings variability); our findings indicate that the RP results are consistent with this theory while the β_1 results are not.

CONCLUSION

The purpose of this study was to investigate the issue of whether financial reports appear to convey, at least in an implicit fashion, information on *ex ante* risk. A corollary issue investigated was whether risk perception, the *ex ante* measure of risk used in this study, was an adequate proxy for a stock's market risk.

Our findings indicate that the seven accounting measures of risk used in the study explained approximately 79 percent of the variation in the average risk perceptions of the financial analysts surveyed. This result provides some evidence that financial reports apparently convey, at least in an implicit fashion, information on risk. Our findings also indicate that the analysts' risk perceptions were a relatively good surrogate for a stock's market risk.

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[9] This finding suggests that the significance of the dividend pay-out ratio *may* be attributable to errors in the traditional measure of market risk. Other explanations are also possible; for example, Elgers [1980] presents evidence which suggests that the relationship between market risk and accounting risk may not be stable over time.

Several major *caveats,* however, are in order. First, we cannot be sure that the risk perceptions of the financial analysts in our sample are representative of the risk perceptions of the market. This is a necessary cost of dealing with a totally future-oriented measure of risk (i.e., risk perception) rather than a measure such as beta which reflects past data. Second, as Beaver, Kettler and Scholes [1970] point out, our evidence is open to two interpretations. We are uncertain whether the financial analysts in our sample actually used the accounting risk measures in formulating their perceptions or whether the risk perceptions and the accounting data jointly reflect the same underlying events; that is, the financial analysts could be merely reacting to the underlying events and not to the accounting data. What is important, however, is that either interpretation provides support for the relevance of accounting data in assessing risk. Finally, the present research is also only an *indirect* test of the relevance of accounting information in that only the company names, and no accounting data, were supplied to the respondents. A desirable follow-up study would have respondents assess risk on the basis of accounting risk measures only—that is, without the names of the companies. This would provide a direct test for the relevance of accounting information in assessing risk.

In conclusion, the allocation of resources is facilitated by the existence of financial markets in which information on both return and risk is available and accessible to those who seek it. Financial reporting is an integral part of this allocation process, and thus it is important to study the extent to which financial reports convey relevant information on risk as well as on return. More extensive studies on risk perception along the lines of the present study may help. Traditionally, studies have dealt with the concept of risk by using market-data-based measures of risk, especially *ex post* beta. However, there remain serious questions regarding the ability of *ex post* beta to reflect *ex ante* risk accurately. Since assets are actually allocated on the basis of *ex ante* risk and return, an examination of the efficiency of the investment process necessarily involves an examination of *ex ante* measures. The present study is a preliminary attempt to deal with risk in a manner that is truly *ex ante.* It demonstrates that risk perception is a measure that performs quite well in comparison with traditional measures of risk. Thus, risk perception as defined and measured in this study offers a promising alternative for dealing with risk in a theoretically pleasing way—that is, *before* rather than *after* the fact.

APPENDIX

VARIABLE DEFINITIONS

- Dividend Pay-out*: cash dividends per share divided by earnings per common share
- Current Ratio*: current assets divided by current liabilities
- Asset Size*: the natural logarithm of total assets
- Asset Growth: the average of the natural logarithm of the ratio of terminal asset size divided by the initial asset size, measured over the five-year period of 1977–1981.
- Leverage*: total senior debt divided by total assets
- Variability in Earnings: the standard deviation of the price-earnings ratio, measured over the five-year period of 1977–1981.
- Covariability in Earnings: the beta coefficient obtained by regressing an economy-wide average of the price-earnings ratio (based on the S & P 500) on firm i's price-earnings ratio, measured over the five-year period of 1977–1981.

* Measured using data from the 1981 year-end annual report.

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THE ACCOUNTING REVIEW
Vol. LX, No. 2
April 1985

COMMENTS

Alternative Interim Reporting Techniques Within a Dynamic Framework: Comments and Extensions

William S. Hopwood and Paul Newbold

IN an interesting recent paper, Fried and Livnat [1981], hereafter FL, conduct a formal analysis of alternative methods for interim earnings reporting. Their purpose was to investigate the conditions and assumptions under which these methods individually produce the most desirable results, given assumed sets of objectives. To simplify matters, FL consider a year with two periods, 1 and 2, and where an interim report is to be prepared in period 1. They impose the constraint that just a single number is to be reported at this time.

Let X_t denote cash flows in period t. Then FL assume that, at period t, management can make the disaggregation $X_t = s_t + e_t$, where s_t is the "permanent component," which will typically be auto-correlated, and e_t is the "transitory component," which will not. These two components are assumed to be statistically independent of one another, and it is further assumed that

$$\left.\begin{aligned} &E(s_i)=\bar{s}_i,\ \mathrm{Var}(s_i)=w_i^2,\ \mathrm{Cov}(s_1,s_2)=k;\\ &E(e_i)=0,\ \mathrm{Var}(e_i)=u^2,\ \text{and}\ \mathrm{Cov}(e_1,e_2)=0.\end{aligned}\right] \quad (1)$$

It is extremely important to know to what these distributions refer. FL make it clear that they are distributions conditional on information available before the first report. Thus, we can think of $\bar{s}_1$, for example, as the forecast of the first period permanent component, prior to period 1, and w_1^2 as the prediction error variance for this component.

It is, however, essential to go further than this and ask on whose information these distributions are conditioned—management or users. The point is not trivial, since management will have more information than users. In fact, the subsequent development of the FL paper makes clear that conditioning is on *users'* information, and moreover that users must be able to calculate $\bar{s}_i$, w_i^2, etc., in order to modify their forecasts when new information becomes available.

Within this framework, FL consider three possible reports in period 1:

(i) Discrete approach: report X_1,

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Manuscript received September 1983.
Revision received February 1984.
Accepted May 1984.

(ii) Integral approach: report $\frac{1}{2}(X_1+\hat{X}_2)$, where $\hat{X}_2$ is the management forecast of X_2 made in period 1, and

(iii) Combination approach: report $\frac{1}{2}(s_1+\hat{s}_2)+e_1$, where $\hat{s}_2$ is the management forecast of s_2 made in period 1.

The information provided in the first period report is evaluated on the basis of three possible user objectives:

(i) Estimation of X_1,
(ii) Prediction of X_1+X_2, or
(iii) Prediction of X_2.

Naturally, any conclusions will depend on the ability of management to forecast. Here, FL consider two extreme scenarios:

(a) Perfect management foresight, and
(b) No superior management knowledge.

For any given objective-reporting combination, FL derive the variance of the predictive distribution P(O|R,I), where O is the objective (i.e., X_1, X_1+X_2, or X_2), R is the reported information from a particular method (i.e., discrete, integral or combination), and I is all information available prior to the report. This can be achieved through Bayes' theorem, which gives

$$P(O|R,I) \propto P(O|I)P(R|O,I), \qquad (2)$$

where P(O|I) is the prior distribution and P(R|O,I) is the likelihood. It is assumed that P(O|I) is known, as a result of equations (1).

In essence, the FL analysis is static. In fact, however, the information set I available to the user will depend on the information that has been made available through time. Therefore, it is necessary to set the problem in a dynamic framework. As shown in the next section, when this is done much of the FL analysis does not hold. Essentially, the reason for this is that, contrary to what these authors assume, the conditional moments in (1) are not the same whatever interim reporting method is in use. We wish to emphasize that FL acknowledge limitations on the applicability of their analysis following from the assumptions made. In addition, we commend them for their contribution in defining issues and formalizing an important problem. We now consider extensions of that analysis in a dynamic framework, and where multiple signals may be reported.

OBJECTIVE EVALUATION IN A DYNAMIC CONTEXT

In some specific circumstances, the problem of finding the optimal reporting method is trivial. If we want to estimate X_1, then the discrete approach is best, as there would be no error. On the other hand, if we want to predict X_1+X_2, and management can predict better with its information than could the user with information from the discrete approach, then the integral approach is superior.

However, if the integral or the mixed approach is to be used for specific objectives, other than those for which it was designed, the resulting estimates/forecasts could be very poor. The degree of suboptimality may be substantially more severe than implied by the analysis of FL. To see why this is so, it is necessary to think in terms of a dynamic framework. Suppose that, over time, the integral approach has been in use. Then the time series of reported values will be

$$\frac{1}{2}(X_1+\hat{X}_2)$$

$$(X_1+X_2)-\frac{1}{2}(X_1+\hat{X}_2)$$
$$=\frac{1}{2}(X_1+2X_2-\hat{X}_2)$$

$$\frac{1}{2}(X_3+\hat{X}_4)$$

$$\frac{1}{2}(X_3+2X_4-\hat{X}_4)$$

$$\vdots$$

Notice that, given such a series, the user will never be able to determine the true numbers $X_1, X_2, \ldots$. Neither, in many circumstances, will he be able to get much useful information about them. Consider, for example, the extreme case of perfect management foresight, so that the reported series is $\frac{1}{2}(X_1+X_2)$, $\frac{1}{2}(X_1+X_2)$, $\frac{1}{2}(X_3+X_4)$, $\frac{1}{2}(X_3+X_4)$, . . . In that case, all the user observes is the annual totals, with no indication as to how these are distributed between the two periods of each year. This makes it difficult to estimate X_1 and X_2 separately. Indeed, in some circumstances it may not be possible to find an estimate with finite variance, as the following example illustrates.

Suppose we try to estimate X_1 by $\frac{1}{2}(X_1+X_2)$ when X_t is generated by the "seasonal" model

$$X_t = X_{t-2} + \epsilon_t,$$

where ϵ_t is white noise. This model can be written

$$(1-B)(1+B)X_t = \epsilon_t,$$

where B is the back-shift operator. Now, suppose X_1 is estimated by $\frac{1}{2}(X_1+X_2)$ so that the error of estimation is

$$u_1 = X_1 - \tfrac{1}{2}(X_1+X_2) = \tfrac{1}{2}(X_1-X_2).$$

Then the stochastic process u_t obeys

$$(1+B)u_t = -\tfrac{1}{2}\epsilon_{t+1}$$

and hence has infinite variance. The position is not helped by using previous annual totals. Simply stated, having never observed the seasonal pattern, the user will be in no position to estimate the distribution of the annual total between the two periods.

It may be argued that, even if the published accounts contain no useful information about the individual X_t, we may still be able to estimate/predict them from other publicly available information. This could be so, but since the X_t are never observed, we will not be in a position to learn how good these estimates/forecasts are. In terms of our discussion of the previous section, the following conclusions emerge:

(i) In many realistic circumstances $\bar{s}_i$ will be undefined and w_i^2 infinite;
(ii) Typically the user will not know w_i^2, or even $w_i^2+u^2$; and
(iii) These quantities in any case are not fixed, but depend on whether integral, discrete or combined reporting has been in use. Hence, the prior probabilities P(O | I) in (2) will also be functions of the reporting method.

This final point is crucial. Essentially, FL assume that, whatever method of reporting has been in use, users' predictions of future cash flows will be identical. This is unlikely. In practice, forecasts are based on the *set of information* available at the time predictions are made. However, the reported past values will constitute a part of this information. Thus, the information set available to the forecaster depends on the reporting method in use. It is not necessary to accept that forecasts will be based *exclusively* on reported past cash flows to conclude that optimal predictions depend on the reporting method. The same conclusion emerges unless one takes the extreme view that past values are irrelevant to the prediction of future cash flows. It follows that the findings of FL, which are based on the assumption that $\bar{s}_i$ and w_i^2 are the same whatever the reporting method, break down when the problem is set in a dynamic context.

One conclusion that emerges when the problem is viewed in this light is that estimates of the individual cash flows, under the integral approach, can be very poor. The position is essentially the same when the combination approach is used. The series of reported values is then

$$\tfrac{1}{2}(s_1+\hat{s}_2)+e_1$$

$$(X_1+X_2)-[\tfrac{1}{2}(s_1+\hat{s}_2)+e_1]$$
$$=\tfrac{1}{2}(s_1+2s_2-\hat{s}_2)+e_2$$

$$\tfrac{1}{2}(s_3+\hat{s}_4)+e_3$$

$$\tfrac{1}{2}(s_3+2s_4-\hat{s}_4)+e_4$$

$$\vdots$$

Again, for illustration, consider the extreme case of perfect management foresight, so that the reported series is $\tfrac{1}{2}(s_1+s_2)+e_1$, $\tfrac{1}{2}(s_1+s_2)+e_2$, $\tfrac{1}{2}(s_3+s_4)+e_3$, $\tfrac{1}{2}(s_3+s_4)+e_4$, ... Essentially we have the same problem as before. The FL analysis requires us to have a prior distribution for s_i, based on past information. But we will never observe an individual s_i. In fact, we do not even observe the annual totals of the s_i, since they are presented with error. Our best estimates would be

$$[\tfrac{1}{2}(s_1+s_2)+e_1]+[\tfrac{1}{2}(s_1+s_2)+e_2]$$
$$=(s_1+s_2)+(e_1+e_2)=X_1+X_2$$

and so on. We have already seen that observation of the annual totals does not help much in forming priors for individual values. Certainly, observation of annual totals plus random errors cannot be any more helpful.

In summary, we cannot get worthwhile estimates of s_i and X_i without more information. So, again, estimation of the current value is a hopeless proposition. Interestingly, more can be achieved if the combination approach is reversed, and the reported first period figure is $s_1+\tfrac{1}{2}(e_1+e_2)$ (which makes sense since e_t is unpredictable to users). At least this provides an unbiased estimator of both s_1 and X_1.

The end-product of the FL analysis is a pair of tables presenting estimation/prediction mean squared errors for the nine reporting/objective combinations for each of two extreme scenarios. As we have indicated, these results and the conclusions that follow from them depend on the assumption that the prior distributions are invariant with respect to reporting method. Although the problem certainly is an important one, we have nothing with which to replace these tables. We do not believe it is possible to generalize as to what the prior distributions would be, given that particular reporting methods have been in use. In fact, the position is rather worse than this as, in practice, the user would often not have the information necessary to calculate the estimates and forecasts. Quantities such as w_i^2 typically will be unknown and impossible to estimate, given the information with which the user is presented.

It might serve to make our position clear by specifying the problem to which the solutions of FL do apply. Suppose that, prior to the year of interest, the user is in possession of individual period permanent and transitory cash flow components from all previous years, as well as any other relevant information. The elements of (1) will then be estimable, and we can follow FL in deriving estimates/forecasts of next year's values under the three reporting schemes. This is not, however, the problem of practical interest. We are concerned with the case where a single number is to be reported in each time period, based on one of three reporting procedures. The information available to the user then differs significantly from one reporting method to another.

MULTIPLE SIGNALS REPORTING

We believe that two important points, meriting further discussion, emerge from the FL paper. These are:

(i) the tension between the aim to report a single number and the existence of multiple user objectives, and

(ii) the possibility that management may be able, meaningfully, to break down cash flow into permanent and transitory components.

If this second possibility is indeed practicable, the potential exists for the provision to users of valuable additional information, provided that the restriction that only a single number be reported is abandoned. Indeed, our reading of the FL study is that this restriction provides a potentially serious handicap to users.

This constraint is severe. For example, if user objectives include both estimation of X_1 and prediction of X_2, then optimally both X_1 and $\hat{X}_2$ should be reported.

Interestingly, for users who want to make their own forecasts, it is possible to do even better. This fact emerges from an apparent paradox in the "no superior knowledge" scenario of FL. In spite of management having no superior knowledge, the integral approach leads to better forecasts of the annual total than does the discrete. This apparently counter-intuitive conclusion arises because management *does* have superior knowledge—it knows the decomposition $X_t = s_t + e_t$. We now prove that this knowledge is not irrelevant for forecasting purposes.

Suppose the problem is to predict X_{t+1}, given one or the other of the information sets

(a) $X_t, X_{t-1}, \ldots$ and all other relevant knowledge, or
(b) $s_t, s_{t-1}, \ldots$ and all other relevant knowledge.

Now, we have the model

$$X_{t+1} = s_{t+1} + e_{t+1} \text{ and}$$
$$s_{t+1} = \hat{s}_{t+1} + a_{t+1}$$

where $\hat{s}_{t+1}$ is the optimal predictor of s_{t+1}, given the information set (b), and is independent of e_{t+1} by the assumption of independence of permanent and transitory components. The error term a_{t+1} is the error made in predicting s_{t+1} and is necessarily white noise, independent of $\hat{s}_{t+1}$ and e_{t+1}. Then we can write $X_{t+1} = \hat{s}_{t+1} + (a_{t+1} + e_{t+1})$. Since $\hat{s}_{t+1}$ is independent of the white noise error sum $(a_{t+1} + e_{t+1})$, it follows that $\hat{s}_{t+1}$ is the optimal predictor of X_{t+1}, given information set (b). Moreover, since $(a_{t+1} + e_{t+1})$ is independent of $X_t, X_{t-1}, \ldots$, it follows that $\hat{s}_{t+1}$ is the optimal predictor of X_{t+1} given all the information in (a) *and* (b). Hence, since in general $\hat{s}_{t+1}$ will involve s_{t-j} $(j \geq 0)$, it follows that X_{t+1} is typically better predicted from (b) than (a).

Consider, for example, the simple model

$$X_{t+1} = s_{t+1} + e_{t+1} \text{ and}$$
$$s_{t+1} = s_t + a_{t+1}.$$

Here, the optimal predictor of X_{t+1} given (b) is s_t, with error $(a_{t+1} + e_{t+1})$, having variance $\sigma_a^2 + \sigma_e^2$. Now, using a result given by Granger and Morris [1976],

$$X_{t+1} - X_t = e_{t+1} - e_t + a_{t+1} = \epsilon_{t+1} - \theta\epsilon_t, \quad (3)$$

where ϵ_t is white noise, with

$$\epsilon_{t+1} - \theta\epsilon_t = e_{t+1} - e_t + a_{t+1} \quad (4)$$

and $0 < \theta < 1$.

According to (3), first differences in X_t obey a first order moving average process, with innovation error ϵ_t. It therefore follows that the optimal predictor of X_{t+1}, given information set (a), has error ϵ_{t+1}, with variance σ_ϵ^2. To find an expression for this error variance, we equate the variances and first autocovariances of the two sides of equation (4), yielding $-\theta\sigma_\epsilon^2 = -\sigma_e^2$ and $(1+\theta^2)\sigma_\epsilon^2 = 2\sigma_e^2 + \sigma_a^2$.

Summing gives $(1+\theta^2-\theta)\sigma_\epsilon^2 = \sigma_e^2 + \sigma_a^2$, and, since $0 < \theta < 1$, it follows that $\sigma_\epsilon^2 > \sigma_e^2 + \sigma_a^2$.

Several consequences emerge from this analysis:

(i) If management reports a single series, and we want to predict future X_t, we would be better off having the s_t series. (Note, however, that given s_1 we would have only an estimate of X_1, and so may not be able to better predict X_1+X_2.)

(ii) If both s_t and e_t were reported, we would also get better forecasts of X_1+X_2 than if X_t alone were reported.

(iii) If management can produce efficient forecasts of X_2, then it is not necessary that the user have s_t and e_t separately. It will be sufficient to use management forecasts.

(iv) Users may wish to check management forecasts. Optimally they should then have s_1, e_1, $\hat{X}_2$ (possibly disaggregated). Users could then compare the quality of management forecasts with their own.

In summary, the problem of which *single* figure to report when there are multiple objectives is one for which no satisfactory analytic solution does or can exist. On the other hand, if "multiple reporting" is permitted, a careful analysis can suggest valuable options.

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THE ACCOUNTING REVIEW
Vol. LX, No. 2
April 1985

Alternative Interim Reporting Techniques Within a Dynamic Framework: A Reply

Dov Fried and Joshua Livnat

In a comment on Fried and Livnat [1981], Hopwood and Newbold [1985], hereafter HN, criticize the single-period setting and the single-signal-reporting system that we assumed. In their analysis, HN show by counter-examples that when one adopts a multiperiod world, both the integral and the combination method may result in an infinite variance when the reporting objective is to predict the current period earnings. The intuition behind their examples is that when managers have perfect foresight and the reports always contain half of the annual totals, investors are unable to allocate correctly the annual total among the interim periods, if one assumes that the process generating earnings is seasonal. HN's main criticism stems from our assumption that investors possess the same information set in the beginning of the reporting period for all three methods of reporting. They contend that if different accounting methods were used in the past, the information set would necessarily be different and results would therefore be method-dependent.

It should be noted at the onset that we were aware of this issue and explicitly stated in our paper (pp. 496–497):

> As noted above, the reporting horizon is assumed to consist of only two interim periods. In reality, users are exposed to interim reports of previous years in addition to other sources of information. Thus, users of interim reports are assumed to form their prior distribution . . . by incorporating the available information at that time. The prior distribution . . . should, therefore, be considered as conditional on some information set, ϕ. This information set, ϕ, represents the other sources of information available to users prior to issuance of the interim report . . .
>
> In general, the issue of deriving the prior distribution is beyond the scope of this study and is left as a subject for future research. Our study is confined to the examination of the alternative interim schemes given a common set of parameters of the prior distribution.

Given HN's comments, however, we feel that it is necessary to point out the context in which our model was intended. First, one of the objectives of the paper was a criticism of the FASB's Discussion

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Manuscript received August 1984.

Memorandum on Interim Reporting (issued at the time), which assumed that the combination approach was superior "on average" to the discrete and/or integral approaches. The aim of our paper was to show that the combination method, which the FASB [1978, para. 92] considered "a more reasoned approach . . . to attempt to obtain the advantages and minimize the disadvantages of each of these views," could in fact be inferior to the other reporting methods. To show this we assumed a starting point which was the *same* for all methods. Using this common ground we showed that the combination method was not superior to the other methods for both scenarios. Our analysis in a one-period framework thus demonstrated that even in the best-case environment—i.e., one in which the starting point for all three alternatives is identical—the FASB's conclusion does not hold.

Moreover, as noted above, since investors have access to other information for breaking down the annual totals, the information set in the beginning of the period may not be as method-dependent as HN suggest. For example, many industry sales and earnings data are reported for interim periods by trade associations. Users can thus derive prior distributions and form expectations regarding interim results from a combination of industry and firm data. Thus, the prior distributions may not be so different, even if different reporting methods had been used in prior periods.

As for the general issue of moving from a single period to a multiperiod or dynamic mode, Professor Fritz Machlup [1959, p. 100] has defined the difference in these terms as: "Typically, 'statics' was what those benighted opponents have been writing; 'Dynamics' was one's own, vastly superior theory."

Multiperiod models may provide results which are different than single-period models; however, at times they may not be able to be solved analytically without some stringent assumptions. Our single-period model was chosen in the context of the above discussion and assumptions, since we were able to make a meaningful comparison of the three methods. HN, who should be commended for pointing out the difficulties in moving to a multiperiod model, acknowledged, however, that they cannot make a similar comparison in a multiperiod model (p. 292): "although the problem is certainly an important one we have nothing with which to replace these tables."

HN further extend our paper in the second part of their comment. HN prove formally that if managers are able to disaggregate the earnings figure into its permanent and transitory components, the disaggregated earnings report is preferred to a single earnings figure, if the reporting objective is the prediction of annual earnings or future quarterly reports.

We also addressed the issue of single- versus multiple-signal reporting systems in the Summary and Conclusions section of our paper [pp. 506–507]:

> Another interesting implication of our results affects the amount and type of detail which should be presented in interim statements. In our analysis, it was assumed that both items reported under the combination method are presented as one aggregate figure. This assumption is in line with current practice . . . wherein cost figures in statements are not presented in a disaggregated fashion . . . [I]f the items which are given the integral treatment are presented separately from the items reported under the discrete method, the ranking of the combination method would be greatly improved . . . [F]or both scenarios, the combination method would rank second for objectives 1 and 2 no matter what environmental assumptions were made. A similar

> result would obtain for the third objective under the second scenario.
>
> This suggestion would represent a radical change from previous reporting practices, since certain items, such as advertising and purchase price variance, would have two separate figures—one for the permanent portion and a second for the transitory portion. The end result, however, would be that the performance of the combination method would be greatly enhanced, thus perhaps achieving the FASB's desired purpose.

Here again, as noted in the above quotation, we pointed out that our selection of the univariate approach was motivated by the context of present reporting practices with which we were working.

We did investigate and reported (see quotations above) the rankings of each method if the permanent and transitory component were reported separately. We did not consider this issue any further, given current accounting practice and earlier work on this issue by Barnea, Ronen and Sadan [1975].

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April 1985

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THE ACCOUNTING REVIEW publishes the results of deductive and inductive research in all areas of accounting and contributes to the advancement of accounting education. Emphasis is placed on the aptness of the research question, the suitability and soundness of application of the research methods, the effectiveness with which the entire exercise is communicated to the reader, and, above all, the significance of the research as an addition to the stock of knowledge. Manuscripts should be written concisely and should be no longer than is necessary to convey the purport of the research. Mathematical notation should be used only when it is the most effective and efficient way to communicate the results of the research.

Brief comments on previous articles published in THE ACCOUNTING REVIEW will be considered for publication in the Comments section if they make an important contribution. Commentators should first send their contributions to the author of the original article in order to endeavor to eliminate any misinterpretations or misconceptions. Following this step, any residue of the comment, together with copies of the correspondence, may be submitted for editorial review. Once a comment has been accepted for publication, the author of the original article will be invited to submit a reply in the same issue, if it is supplied within a reasonable period of time.

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The Editor will make every effort to obtain competent and prompt reviews of manuscripts in order that publication decisions may be facilitated. The review process will normally require two months. The Editor will ordinarily designate two reviewers who will be requested to comment on the research question, the method employed, the intelligibility of the author's presentation, and the significance of the research contribution. Where revisions are recommended, the reviewers will be asked to suggest specific areas of improvement. It is normal practice to forward to the author the reviewers' comments. In the review process, manuscripts are sent to the reviewers with the author's name removed unless the manuscript has been so prepared as to make it impracticable to disguise the author's identity. Reviewers' names will not be revealed to the authors.

Depending on the number of revisions required before a manuscript is accepted for publication, the length of time between original receipt of a manuscript and its date of publication will typically be between fifteen and twenty months.

If the editor makes significant editorial changes in an accepted manuscript, the edited copy will be sent to the author or to one co-author before typesetting. Galley proofs will be sent to the author or to one co-author for proofreading, although overseas authors may not always be able to reply through regular channels before the proofs are returned to the printers.

THE ACCOUNTING REVIEW is published on the first of January, April, July, and October. When a manuscript is accepted, the author will be advised of the issue in which his/her article will appear. Subsequently, the author will be asked by the Production Manager to meet specified deadlines after reviewing the edited manuscript and, later, the page proofs.

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THE ACCOUNTING REVIEW
Vol. LX, No. 2
April 1985

EDUCATION RESEARCH

Jack E. Kiger, Editor

A Descriptive Analysis of Authorship in *The Accounting Review*

Paul F. Williams

ABSTRACT: This paper provides a description of recent authorship in *The Accounting Review* (*TAR*) in terms of authors' schools of affiliation and degree. The analysis is confined to American universities. Comparisons with similar studies in economics and finance, with previous studies of accounting journals, and with the *Journal of Accounting Research* (*JAR*) result in the following conclusions: 1) concentration of authorship in *TAR* is greater for degree school than school of affiliation, which is consistent with the experience in other disciplines; 2) the concentration by certain degree schools is persistent over time; and 3) certain degree schools have been dominant in both *TAR* and *JAR* through time. The general conclusion is that there is some evidence suggesting an institutional element that influences the accounting research published in *TAR*. Additional research projects are suggested which might answer why this institutional element is present and whether it contributes to the perceived decline in the epistemic quality of *TAR*.

The Accounting Review (TAR) has the potential to influence the development of ideas in accounting research. The basis for this assertion is the frequently replicated result that, for at least the last 15 years, accounting academics have perceived *TAR*, along with the *Journal of Accounting Research (JAR)*, to be an important indicator of accounting research acceptability [Coe and Weinstock, 1969 and 1983; Benjamin and Brenner, 1974; Weber and Stevenson, 1981].

While *TAR* is perceived to be a standard of excellence, the recent editor of *TAR*, Professor Stephen Zeff, raised several concerns about trends in accounting research affecting the epistemic quality of *TAR* [Zeff, 1983]. These concerns are summarized below:

1) "[T]he 'wave of rigor' that has engulfed the accounting literature since the 1960s has led to a lesser inclination to tackle big questions" [Zeff, 1983, p. 133]. The corollary to this development is that much research is overly narrow and thus precludes

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Manuscript received June 1982.
Revisions received November 1982, May 1983, June 1984 and September 1984.
Accepted November 1984.

wide dissemination among accounting scholars.

2) "So often it seems that manuscripts are the result of methods in search of questions, rather than questions in search of methods" [Zeff, 1983, p. 134]. The potential effect of this working of the law of the instrument is the creation of scientific technocracies rather than the development of a body of accounting "knowledge."
3) "[T]he very proper emphasis on rigor in the application of modern empirical and analytical research methods to accounting questions may endanger the successful coexistence of classical approaches" [Zeff, 1983, p. 134]. While Zeff posits history as one of these classical approaches, other examples include case studies, sociological inquiry, philosophical treatises, and studies of comparative accounting systems.

It seems apparent, then, that the epistemology of accounting research lacks adequate breadth to entertain editorial preferences for what "should be" available for publication. The nature of this lack of breadth encompasses two areas: 1) an emphasis on method in accounting research, and 2) the inadmissibility of certain accounting research questions to the literature. If epistemological considerations are the sole driving force, the tenor of such a description of the research appearing in *TAR* would not seem appropriate. *TAR* is merely documenting the maturation of accounting science. But the accounting research appearing in *TAR* may also be driven by institutional forces which influence the types of research manuscripts available.[1] Such a situation has been noted in both finance and economics (discussed below), two disciplines closely allied with accounting.

Previous studies touching upon the institutional element of *TAR* [Bazley and Nikolai, 1975; Andrews and McKenzie 1978; Windal 1981] were motivated by a desire to rate accounting programs. Our objective differs. The assumption underlying these studies was that certain journals are independent standards by which to evaluate the research capability of each of those programs. But the data provided by these studies can be used in an inverted way to test the validity of assuming that *TAR* is really an independent standard. The purpose of this paper is to combine the results of these studies with additional recent data to determine whether an institutional element is present in *TAR*. If so, *TAR* may not be an independent standard of scholarship so much as a medium for marketing institutionally-sanctioned ideas. The comparisons made in this study will provide some indication of the extent to which institutional constraints might contribute to the situation described by Zeff.

The remainder of this paper is divided into three sections. The first section describes the association of *TAR* with specific institutions. Aspects of institutions include authors' schools of affiliation and degree schools. Schools are confined to American universities. A second section describes institutional associations between *TAR* and the other leading accounting journal, *JAR*, to evaluate the extent to which *TAR* and *JAR* may be considered alternatives as documents expressing accounting research and ideas. The final section summarizes conclusions drawn from these descriptions and contains some recommendations for additional research.

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[1] In the context of this paper, institutional forces derives its meaning from its root word institution, defined not merely as an organization, e.g., a university, but more broadly to include any established and accepted set of laws, habits, customs, or modes of thinking.

INSTITUTIONAL REPRESENTATION IN THE ACCOUNTING REVIEW

Previous Studies

Description of the association between author affiliation and publications is important to the purposes of this paper for at least two reasons. First, published works are frequently spin-offs from dissertations [Zink, 1980]. These dissertations are often highly specialized and conducted under the tutelage of a faculty publicly known for a narrow research technology. To the extent that a specific technology is in vogue, then a specific institution can produce a significant impact upon published research. To address this issue, we examined authors' school of degree. Second, faculty members at certain institutions are themselves publishing in highly specialized areas of research. For this reason, we examined authors' school of affiliation. The methods we employ are similar to those of Hogan [1973], Yotopoulos [1961], and Siegfried [1972] for the economics literature and Klemkosky and Tuttle [1977] and Schweser [1977] for the finance literature. These authors found a high level of concentration and stability by both school of degree and school of affiliation. Hogan [1973] rank-ordered schools by their authors' contributions to percentage of total pages in each of three leading journals in economics.[2] He investigated both the authors' affiliations at the time of publication and the schools where they received their degrees. Hogan found not only the previously observed concentration by school of affiliation (e.g., Yotopoulos [1961], Siegfried [1972]), but also an even greater concentration by schools of degree.

Henry and Burch [1974], using the percentage of pages metric employed by Hogan, ranked schools of affiliation in *The Accounting Review* and *Journal of Accounting Research* combined for the periods 1961–65 and 1966–71. They found that the percentage of pages for the first 20 schools ranged from .66 to 6.09 in 1961–65 and 1.15 to 5.66 in 1966–71; the first 20 schools accounted for approximately 50 percent of the total pages. Klemkosky and Tuttle [1977], using a similar method, conducted a survey of finance journals with similar results. The first ten schools of affiliation accounted for 33 percent of total pages; the first 20 schools accounted for 50 percent of total pages. These results provide some earlier evidence of institutional concentration in the business and economics literature.

The Current Study

To describe the authorship of *TAR* during the period under study, an analysis of schools of affiliation and schools of degree, similar to the previous studies, is conducted. The analysis includes the population of 103 main articles, 30 notes, and 49 education articles published in *TAR* during the four-year period, July 1978 through April 1982.[3,4] A salient characteristic of this population is the scarcity of authors who published in *TAR* more than once during that period. Two hundred and forty-four different authors were represented in the 182 articles, and only 36 (14.75 percent) appeared more than once either as a single or joint author. Of those 36, 32 repeated only once, three re-

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[2] The journals were *American Economic Review, Journal of Political Economy*, and the *Quarterly Journal of Economics*.

[3] The description of authorship excludes manuscript winners and commissioned papers. This was done on the assumption that the selection process for these two categories of articles was sufficiently different from that for other articles to warrant their exclusion.

[4] Notes appeared as a separate section for the first time in 1979. Selection of the July 1978 issue as the starting point for this study was prompted by an original concern of the authors with examining the amount of time from submission to acceptance of manuscripts. This information was not published prior to July 1978. The analysis of acceptance time data was deleted in the review process.

TABLE 1

EQUIVALENT ARTICLES BY SCHOOL OF AFFILIATION

School	Total Equivalent Articles: 7/78–4/82 (Percent of total in Parentheses)		Windal Rankings* 1973–1977 (Total Articles)	Bazley/Nikolai 1/68–7/74 (Main Articles Only)	First Ten By Equivalent Main Articles 7/78–4/82
1. Iowa	6.17	(3.4%)	Texas	Chicago	Iowa
2. Georgia	6.00	(3.3%)	Illinois	Stanford	Michigan
3. Michigan	5.50	(3.0%)	NYU	Illinois	Northwestern
4. Northwestern	5.50	(3.0%)	Chicago	Cornell	Stanford
5. Texas	4.50	(2.5%)	VPI	Texas	San Diego St.
6. NYU	4.33	(2.4%)	North Carolina	Purdue	NYU
7. Illinois	4.00	(2.2%)	Wisconsin	Penn State	Illinois
8. San Diego St.	4.00	(2.2%)	Washington	Michigan	Texas
9. Oklahoma	3.50	(1.9%)	Penn State	Michigan State	Georgia
10. Purdue	3.25	(1.8%)	Missouri	Washington	Purdue
				Wisconsin	Wisconsin
Other Schools	126.58	(69.5%)			
No Affiliation	8.67	(4.8%)			

* Windal ranks may not be complete since the only schools included were the top 25 on all articles. Some schools not included may have been prominent in *TAR*.

peated twice, and one repeated three times. Two features of this population are examined: school of affiliation at time of publication and school from which author degrees were granted.

Authorship by School of Affiliation

Table 1 identifies the first ten schools in terms of faculty affiliations of published papers in *TAR*. Table 1 does not discriminate by type of article (main, note, education); it reports articles by school of affiliation for all articles combined.[5] The Appendix includes the same data partitioned by type of article.

Rather than use percentage of pages as the criterion measure, Table 1 is constructed on the basis of equivalent articles. This measure is used because it does not confound article length with quality of an author's contribution to the journal. Our assumption is that articles make equivalent contributions to the journal irrespective of the length of the article. On an equivalent article basis, an author receives credit for a whole article only if that article is single-authored. For multiple-author articles, each author receives an equivalent number of articles equal to one divided by the number of authors.

The data in Table 1 include comparative data reported by Windal [1981, p. 655] and Bazley and Nikolai [1975, p. 607]. The Windal study covered the period 1973 through 1977, and the Bazley and Nikolai study covered the period January 1968 through July 1974. Windal did not employ an equivalent author concept to his data; each school represented by a multiple author received credit for a whole article. Thus his data are biased in favor of multiple authors from the same school. Bazley and Nikolai did employ an equivalent author concept but only included main articles.

The last column of Table 1 includes author by school of affiliation data for main articles only. Based on a comparison with the Windal rankings, there appears to have been a change in the composition of the schools in terms of published articles since 1977. Only Texas, Illinois, and New York University are common to both lists. However, comparisons with the Bazley and Nikolai compilation based on equivalent *main* articles indicates no dramatic change in the most represented schools. Considering only main articles, six schools which were in the first ten from 1968 through mid-1974 remain during the period mid-1978 through mid-1982.

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[5] School of affiliation was defined as the school at which the author permanently resided. Thus an author on visitation had his equivalent article credited to his permanent school, not the school he was visiting.

Big Ten schools are well represented in both periods. Each of the lists includes five of the Big Ten schools.[6] If we compare the Big Ten publications in *TAR* to the underlying population of accounting faculty, we find that while the Big Ten schools in the first ten account for approximately 1.6 percent of all faculty in the United States, they account for 13.4 percent of all articles published in *TAR*.[7] This comparison does not account for those faculties that have primarily a teaching responsibility. Nonetheless, across all types of articles, *TAR* includes a wide representation of schools. One hundred and eleven schools of affiliation appeared in *TAR* during the past four years. In addition, no single school is preeminent. In the Hogan [1973] study, a single school of affiliation clearly dominated others for both the *Journal of Political Economy* (Chicago: 10.6 percent vs. the next school, Carnegie-Mellon: 2.8 percent) and the *Quarterly Journal of Economics* (Harvard: 12.3 percent vs. MIT: 4.6 percent). Such is not the case with *TAR*. However, since these are "in-house" journals, a comparison with *TAR* perhaps is not a fair one.

Examining school of affiliation by type of article (main, note, and education) reveals that only two schools, Iowa and Michigan, appear on more than one list. Iowa appears in both the main articles list and the notes list while Michigan appears in both the main articles and the education lists. Though Big Ten schols have been well represented in *TAR* through time, domination by schools of affiliation is not indicated.

Authorship by School of Degree

The second stage of analysis involves examining the relationship between equivalent articles and authors' school of degree. Data about authors' degrees were collected from the *Accounting Faculty Directory* [Hasselback, 1981]. Because this data source includes primarily individuals from American universities, authors from foreign schools, authors who were nonaccountants, and authors who were nonacademics were not included. Consequently, there are a number of "missing values" in the data. However, since our principal motivation is to study the distribution of American universities in publishing in *TAR*, elimination of these authors is appropriate. The only problem this creates is the elimination of those potential authors who were trained at American universities but are now working in foreign countries.

It is quite likely that some of the foreign authors received their training at American universities. If the American universities they attended are the ones appearing in the first ten, then their inclusion would have only the potential to affect the relative position of schools but not the composition of the first ten itself. If the dis-

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[6] The Big Ten schools are: Illinois, Indiana, Iowa, Michigan, Michigan State, Minnesota, Northwestern, Ohio State, Purdue, and Wisconsin.

[7] Henry and Burch [1974, p. 58] report that Big Ten schools account for 13.77 percent (15.38 percent) of the available pages in *The Accounting Review* and *Journal of Accounting Research* during 1966–71 (1961–65). These results are consistent with those of the current study.

TABLE 2

COMBINED EQUIVALENT ARTICLES BY SCHOOL OF DEGREE

School	*Equivalent Articles*	*Percent of Total Articles*	*Percent of Articles U.S. Degrees Only*	*Percent of U.S. Degrees Since 1966*	*Percent of U.S. Degrees Overall*
1. Texas	15.33	8.4	10.2	6.3	5.9
2. Illinois	9.75	5.4	6.5	9.3	8.1
3. Michigan St.	8.16	4.5	5.4	4.5	4.0
4. Ohio State	7.33	4.0	4.9	3.1	3.0
5. Michigan	5.83	3.2	3.9	2.7	2.7
6. Cal.-Berkeley	4.67	2.6	3.1	2.0	2.3
7. Chicago	4.50	2.5	3.0	1.9	1.7
8. NYU	4.50	2.5	3.0	2.3	3.4
9. Washington	4.00	2.2	2.7	2.5	2.5
10. Wisconsin	4.00	2.2	2.7	2.5	2.2
Other U.S. Schools	82.18	45.1	54.7	62.9	64.2
Foreign Schools	13.00	7.1	NA	NA	NA
Non-Accountants	12.75	7.0	NA	NA	NA
Non-Academics	3.33	1.8	NA	NA	NA
Unaccounted	2.67	1.5	NA	NA	NA

tribution of the American universities the foreign authors attended is similar to that of all the schools attended by American authors, then the inclusion of foreign authors could be expected to change only the number of equivalent articles per school, not the composition or ranks of the first ten. If, however, the distribution of American degree schools is dissimilar between foreign and American authors, the inclusion of foreign authors might change the composition of the first ten. Of the three possible effects of this omission, the third possibility is the only one of potential seriousness to this study. Subsequently reported conclusions would induce the assignment of a low probability to this third possibility. The analysis presented below suggests that the third possibility is unlikely.

In spite of the potential biases associated with excluding foreign authors, the results of ranking by school of degree do provide some insight into the issue of concentration by degree school in *TAR*. The rankings of schools by degree of author are presented in Table 2. As in the affiliation analysis, only the first ten are provided. The same data partitioned by type of article are presented in the Appendix.

The rankings by school of degree presented in Table 2 reveal that graduates of the University of Texas at Austin are, in absolute terms, the most frequent publishers in *TAR*. However, these rankings can be deceptive since some schools graduate many more doctoral students than others. For this reason, Table 2 contains as well two columns indicating the percentage of degrees granted by the first ten schools since 1966 and overall.[8] Comparing the percentage of total graduates from that school to all graduates reveals that, except for Illinois, all schools in the first ten in absolute terms have a greater percentage of articles in *TAR* than their percentage of graduates.

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[8] The percentage of degrees since 1966 was calculated on the basis of figures given by Hasselback [1981, p. 1]. The percentage of degrees overall was calculated by counting the number of Ph.D., DBA, DCS, LLM, and JD degrees given by each school for all faculty listed in Hasselback [1981].

A simple chi-square test of frequencies of articles by the first ten schools and frequencies of articles by all other schools was conducted. The expected frequency of a school's appearance in *TAR* was the proportion of degrees granted by that school to all degrees granted. Articles by authors for whom degree schools were unknown were eliminated from the analysis. This resulted in a total of 150.25 articles of which 68 were authored by graduates of the first ten. The observed chi-square was 5.85, significant at $\alpha=.05$.[9] Thus, graduates of the first ten are, in general, more represented in *TAR* than their colleagues who received degrees at other schools.[10]

This result is consistent with Hogan's study of the economics literature, but not to the same extreme. For the three journals Hogan studied, the differences in percentage of pages between the first ten by school of affiliation and the first ten by school of degree were 27 percent, 38 percent, and 27 percent. For *TAR* the same difference for equivalent articles, as a minimum, is 12 percent. Though there is greater concentration by degree schools than by affiliation schools in *TAR*, the phenomenon is not as pronounced as in the journals tested by Hogan. However, concentration to the extent observed by Hogan should not be expected in *TAR* since two of the journals Hogan studied were published by the schools that dominated them. Since *TAR* is published by an organization representing a large group of accounting academics, it should be expected to exhibit a lesser degree of concentration than journals published by a particular "shop."[11]

Another important issue is whether there has been any change over time in articles published across degree schools. Our rankings are compared to those of Bazley and Nikolai to determine if there has been a shift over time. This comparison is presented in Table 3.

The comparison of only main articles reveals that seven schools are common to both sets of data. The comparison of all articles (main, notes, and education) reveals that nine of the ten schools in each list are the same. The only school that does not appear in the most recent list is Stanford, having been replaced by NYU. Thus, there appears to have been little change in the top degree schools appearing in *TAR* over the past decade.

TAR AND JAR COMPARED

The earlier studies cited in this paper demonstrate that, along with *TAR*, *JAR* is perceived as a highest quality journal in accounting. Professor Zeff's laments about the problems with accounting research as it affects *TAR* may not be cause for concern for the epistemology of accounting if these two journals taken together represent a broader area of inquiry. In this section, the same institutional issues for *JAR* as for *TAR* are examined.

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[9] When percentage of graduates since 1966 was used to create expected frequencies, the observed chi-square was 4.29, still significant at $\alpha=.05$. When all articles with author of unknown degree school were included in the category of other schools, i.e., assuming none got their degrees from a first ten school, the observed chi-square was .193, not significant at $\alpha=.05$. When only foreign authors were included in the other school category, i.e., assuming only no foreign faculty got their degrees from top ten schools, the observed chi-square was 2.44, not significant at $\alpha=.05$.

[10] This does not mean that there are not some schools whose graduates are more represented than those of the first ten. For example, Carnegie-Mellon has two equivalent articles to its credit, or 1.1 percent of the total. Its graduates are only .5 percent of the total graduates, so its relative appearance in *TAR* is better than that of any of the first ten schools. There are many more examples of schools whose relative appearance is far less.

[11] Another interesting result obtains when representation in *TAR* of degree schools by geographic region is assessed. During the four-year period covered in this paper, the number of all articles per graduate for each of

TABLE 3

FIRST TEN BY MAIN ARTICLES BY SCHOOL OF DEGREE

Rank	*Period 7/78–4/82*	*Bazley/Nikolai 1/68–7/74*
1	Texas	Illinois
2	Michigan State	Chicago
3	Illinois	Stanford
4	California-Berkeley	Michigan
5	Ohio State	Michigan State
6	Chicago	Ohio State
7	Purdue	Texas
8	Cornell	California-Berkeley
9	NYU	Washington
10	Wisconsin Kansas	Wisconsin

To compare *TAR* with *JAR*, authorship of the issues of *JAR* for the period of Autumn 1978 to Spring 1982 (including Supplements) is analyzed in a parallel fashion to that in the preceding section. The data to follow include authors of articles and research reports, but not capsules and comments. Authors of articles in supplements are included; discussants of those articles are excluded. This set of authors is consistent with that employed by Bazley and Nikolai and enhances the comparability of this study with theirs.

Authorship in *JAR* was, for all comparisons, more concentrated than for *TAR*. Of the 171 authors appearing in *JAR* during the period surveyed, 22 percent were multiple authors (vs. 14.75 percent for *TAR*). A greater tendency thus existed for an author to appear more than once in *JAR* than in *TAR*.

School of affiliation data for *JAR* appear in Table 4 along with similar data for both the Windal and Bazley and Nikolai studies. The first ten schools for *JAR* account for nearly twice as many of *JAR's* total articles (49.4 percent) as do the first ten schools for *TAR* (25.7 percent of the *TAR* total). This demonstrates a higher level of concentration by school of affiliation in *JAR*. This higher level of concentration for *JAR* is best understood through the "in-house" issue discussed earlier for Hogan's study.

It is interesting to consider whether, historically, schools which appear in the first ten for *TAR* also appear in the first ten for *JAR*. The data comparing our results with the earlier studies indicate that it is becoming less likely that any one institution will appear on both lists. Bazley and Nikolai report eight schools common to both lists; Windal reports five, and this study only four. Only Texas and Illinois were common to both journals in all three studies.

Data on degree school representation in *JAR* are presented in Table 5. For *JAR*, excluding authors whose degree school is unknown, 68.7 percent of the articles are accounted for by graduates of the first ten schools, representing only 29.6 percent of total graduates. This is substantially greater than the comparable 45.5 percent vs. 35.8 percent for *TAR*. However, the difference

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five regions of the country breaks down as follows:

East/Northeast—.080, South/Southeast—.031, Midwest—.060, Southwest—.074, and West—.054.

Graduates of southern schools lag far behind the rest of the country in terms of publishing in *TAR*.

TABLE 4

EQUIVALENT ARTICLES BY SCHOOL OF AFFILIATION *(JAR)*

School	*Total Equivalent Articles (Percent of total in parentheses)*	*Windal Rankings*†	*Bazley/Nikolai*
1. Chicago*	11.16 (10.1%)	Chicago*	Chicago*
2. Cal.-Berkeley	6.50 (5.9%)	Stanford	Stanford*
3. Illinois*	6.50 (5.9%)	Illinois*	Penn St.*
4. Cornell	6.33 (5.7%)	Texas*	Texas*
5. Washington	6.16 (5.6%)	NYU*	Ohio St.
6. Stanford*	5.66 (5.1%)	Penn St.*	Washington*
7. Iowa	5.00 (4.5%)	Harvard	Carnegie-Mellon
8. NYU	3.50 (3.2%)	Florida	Michigan St.*
9. Texas*	3.50 (3.2%)	Indiana	Purdue*
10. Pennsylvania	3.50 (3.2%)	Georgia	Illinois*

† Windal ranks may not be complete since the only schools included were the top 25 on all articles. Some schools not included may have been prominent in *JAR*.

* Indicates school also appearing on the list for *TAR*.

between the percentages for school of affiliation and school of degree is nearly the same for *JAR* (19.3 percent) as for *TAR* (19.7 percent). Authorship for both *TAR* and *JAR* is more concentrated by degree school than by school of affiliation and by about the same amount. Unlike *TAR*, the top ten degree schools for *JAR* contain fewer Big Ten schools but more private schools.

The stability of degree school representation through time noted for *TAR* is also apparent for *JAR*. Table 6 provides a comparison of the Bazley and Nikolai *JAR* rankings with those of the current study. Seven schools are common to both lists, indicating a comparable stability through time in the graduates who are most frequently represented in *JAR*.

A comparison that reveals something of the institutional nature of publication in the top accounting journals is that of degree schools common to *TAR* and *JAR* for both the current study and that of Bazley and Nikolai. Bazley and Nikolai showed nine degree schools common between the first ten for *TAR* and *JAR*. The current study indicates six schools common to the first ten for both *TAR* and *JAR*. Those six schools—Texas, Illinois, Michigan State, Ohio State, Berkeley, and Chicago—are common to both lists. Graduates of these six schools have persistently been published in both *TAR* and *JAR*. For the period of the current study, graduates of these six schools account for 33.1 percent of the items in *TAR* and 46.9 percent of the items in *JAR*. Combined, they account for 39.1 percent of the items published in the two leading journals. There is thus some evidence to suggest a degree school domination not just of each of the two leading accounting journals, but of those journals combined. Publication success in the leading journals has apparently, for some graduates, been established by their mere choice of school.

CONCLUSIONS AND RECOMMENDATIONS

Based upon analyses discussed, certain institutional issues affect characteristics of *The Accounting Review*. Because of the relatively small number of repeat authors, no evidence emerged to suggest

TABLE 5

EQUIVALENT ARTICLES BY SCHOOL OF DEGREE *(JAR)*

School	*Equivalent Articles*	*Percent of Total Articles*	*Percent of Total Articles Excluding Unknowns*
1. Illinois	12.33	9.3	10.8
2. Chicago	11.16	8.5	9.8
3. Texas	10.00	7.6	8.8
4. Carnegie-Mellon	8.00	6.1	7.0
5. Stanford	7.67	5.8	6.7
6. Ohio State	7.33	5.6	6.4
7. Cal.-Berkeley	6.50	4.9	5.7
8. Michigan St.	6.16	4.7	5.4
9. Florida	5.00	3.8	4.4
10. Cornell	4.16	3.2	3.7
Total	78.31	59.5	68.7

that any small group dominates authorship. However, evidence emerges that institutional, rather than individual, dominance is present. The institutional effects are partitioned into school of affiliation and school of degree, with school of degree the more salient effect. Some speculations about these two effects are discussed below.

School of Degree. Consistent with evidence from earlier studies, degree school representation in *TAR* appears quite stationary over the period 1968 through 1982. According to Hasselback [1981], 34 new doctoral programs accounted for approximately 25 percent of degrees granted since 1968. Thus, descriptively, dispersion of authors' degree schools has not changed as dramatically as dispersion of degree-granting schools. Legitimate reasons for this probably exist; among them are that new programs may not have existed long enough to produce publishing graduates, research pedagogy at newer schools may be less mature than that of older institutions, and newer programs may not produce the volume of graduates common to older programs.

However, it is clear that the acceptability of research in both *TAR* and *JAR* contains a historical-institutional element. The historical element is clear from the fact that the median start time for all United States doctoral programs is 1966 while the median start time for the schools in *TAR* first ten is 1947. Of the first ten only one, Berkeley, began after 1960. Eight of the first ten are among the 20 oldest programs in the country.

In terms of journal policy, evidence exists to indicate that *TAR* may perpetuate this historical-institutional dominance of certain degree schools. Of the members of the editorial staff of *TAR* for the four-year period covered by this study, 50 percent possess degrees from one of the first ten degree schools. These schools account for only 34 percent of the graduates. In addition, during the entire time period covered by this study the editor of *TAR*, except for the current one (a Stanford Ph.D.), has been a graduate of one of the first ten degree schools. However, other schools have increased their editorial representation, since the same first ten degree schools for the period 1968 through

TABLE 6

FIRST TEN BY SCHOOL OF DEGREE: *JAR*

Rank	*Period Autumn 1978–Spring 1982*	*Bazley/Nikolai*
1	Illinois	Chicago
2	Chicago	Michigan St.
3	Texas	Stanford
4	Carnegie-Mellon	Michigan
5	Stanford	Illinois
6	Ohio State	Texas
7	Cal.-Berkeley	Ohio State
8	Michigan State	Cal.-Berkeley
9	Florida	Washington
10	Cornell	Columbia

1974 represented 64 percent of the editorial staff.

School of Affiliation. When published articles are classified by school of affiliation rather than school of degree, no identifiable group of schools is clearly dominant. For all types of articles, 111 schools of affiliation have been represented in the past four years. For main articles only, however, six schools are common to the first ten for both the periods 1968 through mid-1974 and mid-1978 through mid-1982. This suggests that the heterogeneity of schools apparent for all types of articles combined is not uniform across the three categories, main articles, education articles, and notes. To the extent that main articles are most representative of academic research, an historical-institutional element mediates acceptability of research in *TAR*.

Individual Effects. This study examined only the effect of schools on publication patterns in *TAR*. The issues raised by Zeff and reiterated in the introduction to this paper may be understood better through description of the effect of individual accounting scholars. An historical-geographical analysis of the careers of specific individuals as both authors and directors of doctoral students may provide insight into whether publication patterns are best understood in terms of individuals rather than institutions. For example, Christenson [1983] refers to the "Rochester School of Accounting." That title is perhaps a misnomer since the two "founding members" of that school can be tracked to two of the six degree schools that have been most represented in *TAR* and *JAR* during the past decade. To the extent that Rochester research is influenced by the experiences of these individuals at other schools, Rochester may not be a new school in terms of the history of ideas as much as a branch office of rather old schools.

Development of the Accounting Profession. Another historiographic approach to the role of *TAR* in the development of accounting knowledge would address the association between specific schools (and individuals) with development of the accounting profession. For example, acceptance in the standard-setting process of the ideas of certain individuals who happen to be academics may have produced a selection-bias for research ideas simply because those ideas have been endorsed by the profession. It would be interesting to consider whether other researchers whose ideas had little or no impact on the development of the profession have had less impact upon academic publication. Relatedly, what institutional differences exist for these individuals? Is the preeminence of certain schools attributable to the academic quality of the faculties or is it more the result of institutional forces associated with the establishment of the profession?[12]

Development of the AAA. As a journal sponsored by the AAA, *TAR* may be better understood through study of the institutional forces that affect the organization of the AAA. More study and review is needed of the extent to which individuals and institutions control the AAA at the policy-making level. Similarly, study of the same institutional influences on the Editorial Board of *TAR* may provide insight into the level of control vested in institutions.

The Finance Literature. Another interesting question concerns the relationship shared by accounting and finance institutionally. Schweser [1977] studied degree school issues for the *Journal of Finance (J of F)* over the period 1964 through 1975. Of the ten leading degree schools published in *J of F* during 1970–1975, six schools were common to either *TAR* or *JAR* during the period covered in the present study. An institutional study of the extent to which ideas of one discipline are influenced by ideas of the other may prove useful.

Conclusion. Zeff's concerns may relate to institutional forces mediating acceptance of ideas into accounting research. Certainly this paper demonstrates descriptively that the publication process is associated with certain academic institutions, both in terms of doctoral programs and, to a lesser extent, schools of affiliation. We are not debating whether these associations are appropriate; rather, we are demonstrating their existence. If the "wave of rigor" and absence of "classical approaches" that Zeff alludes to are to be understood better, then institutional analysis is a legitimate approach found in other disciplines as well.

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[12] For example, Larson [1977] attributes cognitive exclusivity as a principal instrument through which professions establish a monopoly for their services. To perpetuate cognitive exclusivity, she posits that professions must control the educational process. Recent AICPA accreditation may be an example of an attempt at such control.

APPENDIX A

TOP SCHOOLS OF AUTHOR AFFILIATION BY TYPE OF ARTICLE (EQUIVALENT ARTICLES IN PARENTHESES)

Rank	*Main*	*Notes*	*Education*
1	Iowa (3.67)	Dartmouth (2.00)	Georgia (3.00)
2	Michigan (3.50)	Iowa (1.50)	Indiana (3.00)
3	Northwestern (3.33)	NYU (1.50)	Oklahoma (3.00)
4	Stanford (3.00)	Duke (1.33)	Michigan (2.00)
5	San Diego St. (3.00)	Texas-Arlington (1.33)	Missouri (2.00)
6	NYU (2.83)	Florida State (1.33)	Northern Illinois (2.00)
7	Illinois (2.50)	Purdue (1.25)	Alabama (1.50)
8	Texas (2.50)	Massachusetts (1.17)	24 Schools (1.00)[3]
9	Georgia (2.50)	Northwestern (1.17)	
10	Ten Schools (2.00)[1]	Eight Schools (1.00)[2]	
Unaffiliated	4.00	2.17	2.50

[1] Arizona State, Florida, Harvard, Pitt, Purdue, Wisconsin, Victoria, Tel Aviv, London School of Econ., New South Wales.

[2] Columbia, Kentucky, Minnesota, Missouri, Texas, Washington, SUNY-Binghamton, Virginia, Western Michigan.

[3] Florida, Iowa, LSU, Maryland, Northwestern, South Carolina, Texas, Texas Tech, Boston College, Toronto, Oregon State, Bradley, Virginia, Drexel, Tulsa, Portland State, Miami (FL), California St.-Hayward, California St.-LA, North Carolina State, Utah State, Lehigh, Rice, Notre Dame.

APPENDIX B

TOP SCHOOLS OF AUTHOR DEGREE BY TYPE OF ARTICLE (EQUIVALENT ARTICLES IN PARENTHESES)

Rank	*Main*	*Notes*	*Education*
1	Texas (8.83)	Oklahoma State (2.50)	Illinois (4.75)
2	Michigan State (5.83)	Texas (2.00)	Texas (4.50)
3	Illinois (5.00)	Ohio State (1.83)	Michigan (3.50)
4	Cal.-Berkeley (4.33)	Florida State (1.50)	Washington (3.00)
5	Ohio State (4.00)	Minnesota (1.50)	Penn. State (2.33)
6	Chicago (3.50)	Stanford (1.33)	Indiana (2.00)
7	Purdue (3.33)	Michigan State (1.33)	Georgia State (1.50)
8	Cornell (2.50)	Columbia (1.33)	Massachusetts (1.50)
9	NYU (2.50)	Arizona (1.00)	Missouri (1.50)
10	Wisconsin (2.50)	Arizona State (1.00)	North Texas State (1.50)
	Kansas (2.50)	NYU (1.00)	Ohio State (1.50)
		Free U. (1.00)	Oklahoma (1.50)
			Wisconsin (1.50)

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THE ACCOUNTING REVIEW
Vol. LX, No. 2
April 1985

FINANCIAL REPORTING

Clyde P. Stickney, Editor

Pitfalls in Calculating Cash Flow from Operations

Ralph E. Drtina and James A. Largay III

ABSTRACT: Although many firms now prepare a cash-based statement of changes in financial position, reported "funds from operations" is typically a measurement of working capital. The statement reader wishing to determine cash flow from operations must use a series of indirect adjustments to do so. Our purpose in this paper is to identify the inherent difficulties the reader encounters when using this indirect method to convert reported funds from operations to a cash flow amount. We demonstrate how the indirect method will in fact *not* equal actual cash flow from operations because of numerous conceptual and practical problems encountered when applying the necessary adjustments. We develop illustrations of these problems, and we show how cash flow from operations calculated by the indirect method is, at best, an estimate of actual cash provided by operations.

INTRODUCTION

THE financial community's recent interest in more comprehensive cash-flow reporting, particularly as it relates to evaluating the results of operations, is based on the belief that traditional measures of income and working capital flows may not be good surrogates for cash flow from operations ("cash flow" in this paper). While many firms have changed to a cash-based statement of changes in financial position, they still prefer to report the important "funds from operations" as a calculation *derived* from reported net income. Typically, an adjustment algorithm [Largay and Stickney, 1980] is used, either by the reporting company or the financial statement readers, to convert working capital from operations (WCO) to cash flow from operations (CFO). When we recently undertook an empirical study [Drtina and Largay, 1984] which relied upon this *indirect* conversion method, we found that the validity of the cash flow calculation is dependent upon a set of implicit assump-

The authors thank Ray Bainbridge, Bob Mills, Pete Wilson, and two anonymous reviewers for helpful suggestions.

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Manuscript received July 1984.
Revision received November 1984.
Accepted December 1984.

tions. Unfortunately, publicly reported financial statement data often do not provide the information needed to satisfy these assumptions uniformly across firms.

Much of the difficulty in calculating CFO results from the diversity of formats used by firms in the published statement of changes in financial position (SCFP). Further confusion abounds from the various definitions and lack of clarity relating to the all-important label, "funds from operations." Our primary purpose in this paper is to identify the trouble spots in making the adjustments to calculate cash flow from operations from data currently presented in the SCFP. In most cases, the adjustment process yields an *estimate* of CFO rather than an exact measure. We will also discuss the implications for empirical studies which rely upon cash flow measures, and we will suggest an easy solution to correct the current reporting shortfalls.

DIRECT METHOD V. INDIRECT METHOD ILLUSTRATED

Two alternative methods are available for reporting funds provided by operations in the statement of changes. Assuming funds are defined as cash, the *direct method* would present a listing of cash receipts and cash payments related to the central activities of the firm. The direct method rarely is encountered in practice today [Seed, 1984, pp. 33–38].

Direct Method

Cash Collected From Customers
+ Cash received from dividends and interest
− Cash paid for inventories, services, other operating expenses, and taxes
= CASH FLOW FROM OPERATIONS

On the other hand, the more commonly used format is the *indirect* method which begins with income before extraordinary items and involves a series of adjustments. This method backs into cash flow from operations by (1) removing the effects of accruals, deferrals, and allocations which produced revenues or expenses but did not provide or use cash; and (2) adjusting for operating sources and uses of cash which did not produce revenues or expenses.

Indirect Method

INCOME FROM CONTINUING OPERATIONS
+ Depreciation, depletion, and amortization expense (expense, no cash paid)
+ Deferred income tax expense (expense, no cash paid)
− Undistributed equity method income (revenue, no cash received)
+(−) Amortization of discount (premium) on bonds payable [expense (revenue), no cash paid (received)]
= WORKING CAPITAL FROM OPERATIONS
− Increase in accounts receivable (revenue, no cash received)
− Increase in inventories (cash paid, no expense)
− Increase in prepayments (cash paid, no expense)
− Decrease in accounts payable (cash paid, no expense)
− Decrease in accruals and other current liabilities (cash paid, no expense)
+ Decrease in accounts receivable (cash received, no revenue)
+ Decrease in inventories (expense, no cash paid)
+ Decrease in prepayments (expense, no cash paid)
+ Increase in accounts payable (expense, no cash paid)
+ Increase in accruals and other cur-

rent liabilities (expense, no cash paid)
= CASH FLOW FROM OPERATIONS

The choice of method has consistently been left to the discretion of statement preparers from the early funds statement opinion [APB *Opinion No. 19,* 1971] to the latest FASB *Exposure Draft* [1983], which offers guidance on recognition and measurement for reported financial data. Each method should result in the same dollar amount for cash flow from operations assuming, of course, that the proper adjustments are made. Nonetheless, the direct method has received the support of researchers (e.g., Heath [1978] and Sorter [1982]) primarily because it presents operating cash receipts and payments more clearly.

Since this article addresses the mechanics of calculating cash flow under the two formats, we would like to clarify the equality of the two computations, assuming none of the complications described below exist. Referring to Exhibit 1-Part A, we have listed selected financial data about the continuing operations of a hypothetical firm. The information presented in Part A is self-explanatory; however, observe that the amounts are taken from the income statement, balance sheet, and the cash ledger account. In Part B of Exhibit 1, the direct method uses actual cash receipts and cash payments to calculate CFO of $1,450. The indirect method produces the same amount of CFO of $1,450 through a reconciliation of differences between income, working capital, and cash flow.

One additional concern about the definition of "operations" should be addressed. The distinctions between operating, financing, and investing activities are ambiguous. Even more ambiguity arises if operating activities are separated into those activities central to the firm's principal operations and those which are peripheral in nature. These issues have been addressed, without resolution, by the FASB [1981, para. 19] and by other researchers such as Heath [1978] and Nurnberg [1983]. The definition of operating activities is an important *precondition* for determining the amount of cash flow generated from operations. For example, should dividends and interest received and cash received or paid on short-term bank loans be included with operations? Inconsistencies in classification of current assets and liabilities certainly will affect intercompany comparisons. Moreover, they may cause distortions of the cash generated from operations if calculated under the indirect method. Statement formats also contribute to the confusion, as can be seen in the excerpts from annual reports presented in the next section.

REPORTED FUNDS FLOW—THE PLACE TO START

Given the present state of financial statement reporting practices, how would an analyst determine CFO? The starting point is the funds flow information which the firm is already reporting in its SCFP. "Funds Provided by Operations" is a line item which must be disclosed prominently according to APB *Opinion No. 19* (para. 10–14). Due to the diversity in statement formats, however, readers must determine which definition of funds is reflected in this line item. We found in an analysis of annual reports (discussed below) that the definition of funds used in the statement as a whole is often *different* from the definition of funds from operations. There is a movement towards defining "overall" funds as cash plus cash equivalents. Whereas about ten percent of the *Fortune* 500 companies used a cash-based definition of funds in 1980, over 50 percent did so in 1982 [Seed, 1984, p. 26]. In part, this

EXHIBIT 1

CALCULATIONS OF CASH FLOW FROM OPERATIONS UNDER THE DIRECT AND INDIRECT METHODS

Part A—*Given Data:*	
Income from Continuing Operations	$1,000
Cash Collected from Customers	7,000
Cash Operating Expenses	5,550
Depreciation Expense	700
Accounts Receivable, beginning	900
Accounts Receivable, ending	1,300
Inventory, beginning	1,900
Inventory, ending	1,650
Accounts Payable, beginning	2,100
Accounts Payable, ending	2,000
Part B—*Calculations:*	
Direct Method	
Cash Collected from Customers	$7,000
Cash Operating Expenses	5,550
Cash Flow from Operations	$1,450
Indirect Method	
Income from Continuing Operations	$1,000
+ Depreciation Expense	700
Working Capital from Operations	$1,700
− Increase in Accounts Receivable	(400)
+ Decrease in Inventory	250
− Decrease in Accounts Payable	(100)
Cash Flow from Operations	$1,450

movement is in response to an initiative of the Financial Executives Institute in the early 1980s. This definition usually is indicated at the bottom of the SCFP when the overall change in funds is shown. At the same time, funds from operations are most commonly calculated *prior to* adjustments for changes in noncash current operating accounts. We found that reported funds from operations typically is a measurement of *working capital* (as in Exhibit 1-Part B), even in a cash-based SCFP. Consequently, it is not unusual to see two different definitions of funds within the same "funds" statement.

Diversity in Reporting Practices.

To illustrate the diversity in reporting practices, we first tabulate a breakdown of the funds statement reporting practices of the Dow Jones Industrials in Exhibit 2. These results are consistent with the previous discussion.

Then, to highlight this diversity in more detail, we examine three published Statements of Changes in Financial Position in the following paragraphs. Noteworthy items are identified with a letter in parentheses and discussed in the narrative. Consider first the following condensed

EXHIBIT 2

DEFINITIONS OF FUNDS FLOW FROM 29 OF 30 DOW JONES INDUSTRIALS FIRMS FOR THE 1983 FISCAL YEAR[a]

Funds Definition	*"Reported" Definition for Overall Format*	*"Reported" Definition of Funds from Operations*	*"Actual" Definition of Funds from Operations*
Cash plus cash equivalents	21	4	2
Cash plus cash equivalents less short-term debt	1	0	6
Cash plus cash equivalents less short-term and long-term debt	2	0	1
Working Capital	3	3	18[b]
Other than above	0	1	2
No definition "reported"	2	21	N/A
	29	29[c,d]	29

[a] American Express was excluded since it is a financial services, rather than industrial, firm. Its financial statement format differs considerably from the other DJI Firms.

[b] All but three of the 29 firms included a line in the SCFP for working capital from operations, regardless of the definition or format of "reported" funds from operations.

[c] All 29 firms used the indirect method to calculate CFO.

[d] Three of 29 firms included plant asset transactions in the "funds from operations" calculation.

version of Weyerhauser Company's 1983 SCFP (in 000s).

Funds provided:		
Earnings before extraordinary items	$204,843	
Non-cash charges to income:		
Depreciation, amortization and fee stumpage	340,738	
Deferred income taxes, net	27,744	
Funds provided from operations	$573,325	(a)
Proceeds from sales of stocks and bonds*	164,825	
Decrease in receivables	7,055	(b)
Decrease in plant (net) and other assets*	43,998	
Decrease in current liabilities	(44,965)	(c)
Increase in other liabilities and other transactions*	1,004	
Total funds provided	$745,242	
Funds applied:		
Expenditures for plant, timber leases, and investments*	$367,676	
Cash dividends on preferred, preference, and common shares	197,883	
Increase in inventories and prepaid expenses	47,306	(d)
Payments and other long-term debt changes, net	98,671	
Total funds applied	$711,536	
Net increase in cash and short-term investments	$ 33,706	

*Separate line items on published statement are combined here for ease of presentation.

The overall definition of funds as shown on the bottom line is "cash and short-term investments." We find, however, that the line item "funds provided from operations" (a) excludes adjustments for noncash working capital accounts and thus appears to be a measure of working capital. A reader desiring a measure of cash flow from operations must adjust for changes to noncash working capital accounts—items (b), (c), and (d)—in the statement. Note that these noncash working capital changes themselves are presented in what seems to be an inconsistent order. The *addback* for the decrease in receivables (b) is included as an "other source" of funds but the decrease in current liabilities (c), which is a subtraction to derive CFO in the indirect method, is shown by Weyerhauser as a *negative* source. In contrast, the increase in inventories and prepaid expenses (d), also a subtraction when using the indirect adjustment method, is shown as an application of funds. Finally, notice that Weyerhauser has used a breakdown of funds based upon a "funds provided" and "funds applied" approach. No attempt was made to classify funds flows according to financing and investing activities.

Next, we examine a condensed version of the 1983 SCFP of White Consolidated Industries (in 000s).

OPERATIONS	
Net income	$ 51,783
Depreciation and amortization	38,853
Deferred income taxes	(1,059)
	$ 89,577 (e)
Changes in operating working capital (details omitted)	$103,125 (f)
Changes in property, plant and equipment (net)	$(28,602)
Other noncurrent account adjustments including warranty obligations*	2,782
	$(25,820)
CASH FROM OPERATIONS	$166,882 (g)
FINANCING ACTIVITIES	
Changes in borrowings*	(25,344)
Changes in equity securities and convertible debentures*	67,249
Cash dividends paid	(24,890)
	$ 17,015
INCREASE IN CASH AND EQUIVALENTS	$183,897

*Separate line items on published statement combined here for ease of presentation.

As in the case of Weyerhauser, White has labelled its definition of overall funds on the bottom line of the statement as "cash and equivalents." Unlike Weyerhauser, however, White has specifically identified as a line item its "cash from operations" (g). Somewhat surprisingly, further examination reveals that White has included in the cash from operations amount all its transactions in plant assets and various other noncurrent adjustments, such as warranty obligations. While White has presented a format very different from Weyerhauser's in that funds flows are separated by type of activity, White takes the view that *all* activities other than financing are considered operating.

Therefore, we cannot assume confidently that the line item reported by White as "cash from operations" is comparable with CFO from other firms. We must use some ingenuity to determine what reported cash from operations would be under a more conventional view of operations. Apparently, the *unlabelled* line item (e) of $89,577 represents funds from operations measured in terms of a working capital definition. Consequently, to find the CFO amount described previously in this paper, the $89,577 must be adjusted for noncash working capital account changes. Fortunately, White has reported these changes separately on the statement (f) as $103,125. Hence, the CFO figure most likely to be useful for comparison across firms equals $192,702 ($89,577 + $103,125), an unreported subtotal quite different from reported "CFO" of $166,882.

Our final detailed example of diversity in format of the published SCFP is provided by R. J. Reynolds Industries. A condensed version of its 1983 SCFP follows (in 000,000s).

Funds provided by continuing operations	
Net sales	$13,533
Less operating costs and expenses which required the outlay of working capital	12,097

Total funds provided by continuing operations	$ 1,436 (h)
Funds required by continuing operations:	
Changes in working capital resulting from operations (detail omitted)	$ (213) (i)
Acquisitions and disposals of plant assets*	828
Cash dividends	407
Cumulative translation adjustments and other*	99
Total funds required by continuing operations	$ 1,121 (j)
	$ 315 (k)
Net changes in funds related to discontinued operations	157
Financing transactions:	$ 472
Proceeds from issue of long-term debt and stock*	$ 281
Net change in current notes payable	(205)
Retirements of long-term debt	(430)
	$ (354)
Increase in cash and short-term investments	$ 118

*Separate line items on published statement combined here for ease of presentation.

Once again, we find that overall funds are defined clearly as "cash and short-term investments." Reynolds, however, has presented its funds from operations in a format different from both Weyerhauser and White. Separate line items are labelled as "total funds provided by continuing operations" (h) and "total funds required by continuing operations" (j). An unlabelled line item of $315 (k) represents the difference between funds provided and funds required, and thus would seem to be the net funds from continuing operations. Upon closer analysis we find that Reynolds actually has reported working capital from operations (h), prepared under a *direct* computational method: working capital inflows of $13,533 less working capital outflows of $12,097. Furthermore the unlabelled, but implicit, net funds from operations (k) reflects an *indirect* calculation of operating funds flow similar to White Consolidated Industries, since all funds flows are included in the computation except those which Reynolds relates to financing activities and discontinued operations. The reader seeking a measure of CFO consistent with our previous discussion must reduce working capital from operations, $1,436 (h), by the changes in noncash working capital accounts resulting from operations, $213 (i), to derive cash flow from operations of $1,223.

Changes in the Reporting Entity

Another problem related to reported funds from operations arises when there has been a change in the reporting entity—a common occurrence in this day of acquisitions and divestitures. This problem came to our attention when a firm's adjustments for changes in noncash working capital accounts on the SCFP were *not* equal to the changes in these same current accounts as reported in the balance sheet. For example, American Can Company's 1982 annual report disclosed a net decrease in noncash working capital of $(235.6) on the balance sheet; yet adjustments were made on the SCFP for $(34.2) (see Exhibit 3). Through discussion with a spokesman for American Can, we found that the difference resulted from changes to the structure of the firm's continuing operations. Although American Can itself was *not* a problem (their accountants had separated out those parts of the current accounts related to continuing operations in their cash-based SCFP), reliance solely on the changes in current accounts derived from the company's comparative balance sheets would produce erroneous results.

This problem of determining what part

Exhibit 3

Comparison of Changes in Noncash Current Accounts Derived from Comparative Balance Sheets with Changes Reported in the Funds Statement: 1982 Annual Report of the American Can Company

(in millions of dollars)

Statement of Financial Position

	1982	*1981*	*Change*
Total current assets (less cash and short-term investments	$1,062.1	$1,300.3	$(238.2)
Total current liabilities (less short-term debt)	(752.6)	(755.2)	2.6
Net change to operating noncash working capital accounts	$ 309.5	$ 545.1	$(235.6)

Statement of Changes in Financial Position

	Change
Changes to operating noncash working capital accounts:*	
Receivables	$ 25.7
Inventories	(68.3)
Accounts payable and accrued liabilities	(17.7)
Other	26.1
Net Change	$(34.2)

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* These changes were "add-back" adjustments on the statement of changes to derive cash provided by operations under the indirect method.

of the reported changes in the current accounts resulted from acquisitions or divestitures is critical whether funds are defined as working capital or cash. We observed that the U.S. Steel acquisition of Marathon Oil Company on January 7, 1982, included working capital of $882 million. This amount was buried in the current accounts on U.S. Steel's comparative balance sheets and working capital SCFP. It was disclosed only in the SCFP line item relating to this acquisition that the reported use of funds excluded the working capital purchased. Similarly, the 1982 cash-based SCFP of Air Products and Chemicals showed a subtraction for a $9,708,000 increase in working capital (other than cash and short-term investments). This subtraction, however, *included* working capital of $44,185,000 purchased when Stearns-Roger was acquired on May 21, 1982. Only in the SCFP line dealing with this acquisition was it disclosed that the use of funds excluded the working capital purchased.

While careful analysis of the individual annual report often will enable the reader to cope with this problem, mechanical application of the indirect method will not. Moreover, this problem in interpreting reported data must raise questions about the validity of empirical studies which calculate CFO by applying the indirect adjustment algorithm to data banks such as COMPUSTAT.

PROBLEM AREAS WITHIN INDIVIDUAL CURRENT ACCOUNTS

Assuming the analyst has been able to (1) correctly identify the definition implicit in the reported "funds provided by operations" figure and (2) determine the change in current accounts due solely to the firm's continuing operations, another important series of potential problems looms ahead. When applying the indirect adjustment algorithm to compute cash from operations, the analyst is assuming that each change in a noncash current account relates an operating source or use of cash to an income statement account. For instance, an increase in accounts receivable implies that the sales revenue amount used to calculate the income included in working capital from operations includes sales on account which did not in fact generate cash. Thus, as we have seen in our earlier discussion of the indirect method, an increase in accounts receivable must be subtracted from working capital from operations to derive cash from operations. It is not unusual, however, for some current accounts to change *without* relating an operating source or use of cash to the income statement.

Manufactured Inventory

One commonly encountered case involves the inventory accounts of a manufacturing firm. Under the *absorption costing method* required by generally accepted accounting principles, the work in process and finished goods inventory accounts will include allocations for overhead related to the production process. That portion of overhead which is a variable cost, such as indirect labor, normally has a cash impact and will require an adjustment under the indirect method when inventory changes. The depreciation component of allocated fixed overhead, however, usually has no current cash impact, and addback adjustments must be handled carefully to find cash from operations.

We have presented an illustration in Exhibit 4 to clarify the problems created by manufactured inventory when estimating CFO. In Part A of the exhibit, we assume that a firm has produced 5,000 units during the current period, has sold only 4,000 units, and uses LIFO. The cost to manufacture one unit is $3.00 which includes variable costs (direct material, direct labor, variable overhead) of $2.00 and fixed overhead of $1.00 (depreciation). Consequently, the change in finished goods inventory for the period is 1,000 units at $3.00, a $3,000 increase. Strict application of the indirect method algorithm requires that $3,000 be subtracted from working capital from operations to derive cash flow from operations. In Part B of the exhibit, we have calculated cash flow under the direct and indirect methods. If all sales and variable manufacturing costs were cash-based, the direct calculation of cash flow yields a positive $10,000. Use of the indirect method, however, indicates that cash flow is only a positive $9,000. The difference can be attributed to the adjustments under the indirect method for depreciation and inventory; only $4,000 of depreciation related to the 4,000 units sold was added back because only $4,000 was included in cost of sales as expense. The remaining $1,000 was capitalized as part of the finished goods inventory increase.

From this simple illustration, we see how the use of absorption costing can produce a computational error when the indirect method is used. In order to correct the calculation, the full amount of depreciation—whether expensed or capitalized—must be added back prior to ad-

EXHIBIT 4

DISTORTION IN THE CASH FLOW CALCULATION RELATED TO CHANGES IN MANUFACTURED INVENTORY

Part A—*Assumptions*

1. Schedule of changes in finished goods account in units:

Beginning balance	1,000
Produced	5,000
Available	6,000
Sold	4,000
Ending Balance	2,000

2. Cost per manufactured unit:

Variable cost—direct material, direct labor, variable overhead	$2.00
Fixed cost—all depreciation ($5,000/5,000 units)	1.00
	$3.00

3. Work in process: no change.

Part B—*Calculation of Cash Flow from Operations*

Direct Method

Sales—all cash (4,000 @ $5)	$20,000
Cash expenses (5,000 units produced @ $2 variable manufacturing cost)	10,000
Cash Flow from Operations	$10,000

Indirect Method

Sales revenue	$20,000
Cost of sales (4,000 units @ $3)	12,000
Net Income	$ 8,000
Addback depreciation expensed in cost of sales (4,000 @ $1)	4,000
Working Capital from Operations	$12,000
Less increase in inventory (1,000 units @ $3)	3,000
Cash Flow from Operations	$ 9,000

justing for the change in inventory. Since it is not always clear from published financial statements which depreciation amount is being added back, we examined the annual reports and 10-Ks of four companies with significant manufactured inventories; ALCOA, General Electric, IBM, and Westinghouse. The depreciation addback on the statement of changes agreed with the annual depreciation provision disclosed in the Analysis of Accumulated Depreciation (Schedule VI of the 10-K) for General Electric and IBM. These amounts differed in the cases of ALCOA and Westinghouse.

Current Portion of Long-term Leases

Another current account which has the potential to cause misstatements through use of the indirect adjustment algorithm is the *current portion of long-term leases.* Swieringa [1984] has described the different measures of current and noncurrent portions of a given long-term lease that are permitted by generally accepted accounting principles. His concern is with balance sheet reporting implications, however, and not with cash flow analysis. Indeed, if the current portion of a long-term lease is viewed as a *nonoperating* item, such as bank loans or the current portion of long-term debt, then the indirect adjustment algorithm ignores it and the calculation of CFO is not affected.

The problem arises when the current portion of a long-term lease obligation *is* considered an operating item. We again use an example to describe the problem area. Swieringa [1984, p. 129] discusses the case of a lease obligation calling for 20 annual payments of $40,211 and a discount rate of ten percent. Two methods can be used to value the current portion of the lease. Under (1), the "present value of next period's payments" approach, the current portion at the end of the first year is $36,557 (=$40,211/1.10) while under (2), the "change in present value" approach, the current portion at the end of the first year is $5,977 (=$40,211/1.10^{20}). In effect, method (1) shows the present value of *next* year's payments as a current liability; this amount does not change between the first and 20th years. Method (2), however, shows the present value of the *last* year's payments as a current liability; this amount grows during each year and eventually reaches $36,557 at the end of the 19th year. Swieringa indicates his preference for method (1), which appears more consistent with other discounted cash flow techniques.

It is clear that if the lease is viewed as an operating item, it should have a negative impact on CFO of $40,211, the annual cash payment. Since the interest component of each payment already is reflected in net income, and represents a cash payment, it requires no further adjustment. The indirect method then calls for adding (subtracting) the increase (decrease) in the current portion. Unfortunately, the sum of annual interest expense and the annual change in the current portion of the lease liability almost never equals $40,211; the annual change in the current portion is not the same as the principal component of the annual payment.

To show this, the following tables have been prepared for the two methods. The "Total" columns in these tables represent the cash effects of the annual lease payments implied by use of the indirect adjustment algorithm. For example, with method (1) the current portion increases from $0 to $36,557 (the present value of next year's payment) during the first year. Adding it back suggests that cash of $2,323 was *provided* by the lease payment when in fact it *used* $40,211. From years two through 19, the cash outflow is represented only by the (declining) periodic interest, thereby understating this use of cash.

Method (1)

Year	*Interest +*	*ΔCurrent Portion =*	*Total*
1	$(34,234)	$36,557	$2,323
2	(33,636)	—0—	(33,636)
3	(32,979)	—0—	(32,979)
.	.	.	.
.	.	.	.
.	.	.	.
20	(3,654)	(36,557)	(40,211)

Method (2)

Year	*Interest +*	*ΔCurrent Portion =*	*Total*
1	$(34,234)	$5,977	$(28,257)
2	(33,636)	598	(33,038)
3	(32,979)	657	(32,322)
.	.	.	.
.	.	.	.
.	.	.	.
20	(3,654)	(36,557)	(40,211)

Consequently, we find that use of the indirect method produces the correct cash impact—a $40,211 payment—only in the last year under both methods.

Reclassification of Current Accounts

The final problem area encountered when applying the indirect cash flow algorithm is caused by reclassifications between current and noncurrent accounts. Those who have applied the algorithm in published research (see, for example, Gombola and Ketz [1983]) have adjusted for *all* noncash working capital accounts normally related to ongoing operations. This approach agrees with our earlier detailed listing of the adjustments to current accounts used to calculate CFO. If changes in these current accounts are due to reclassifications within the balance sheet, however, an equivalent change in cash flow will not occur. Applying the algorithm mechanically, without regard to the cause of the change in the current account, produces a miscalculation of CFO when reclassifications are present.

Consider, for example, a two-year trade note receivable dated July 1, 1984 which is due on June 30, 1986. Sales revenue giving rise to the note receivable is recognized in 1984. On the December 31, 1984 balance sheet, the receivable will be classified as a noncurrent asset, but at December 31, 1985, the note will be reclassified as a current asset. In applying the indirect adjustment algorithm at the end of 1985, we would find an increase in current trade receivables which would be subtracted from working capital from operations to derive the cash flow figure. The logic behind such an adjustment is that the increase in current trade receivables resulted from 1985 sales that did not generate cash. But the sales revenue actually was recorded in 1984 and, because the receivable was classified as noncurrent, no subtraction was made in that year. As a result, the indirect adjustment algorithm would produce a misstatement of CFO in 1984 because *no* adjustment was made and in 1985 because there was no revenue to offset the adjustment that *was* made.

CONCLUSION

In this paper we have demonstrated that use of the indirect method to calculate cash flow from operations from published financial statements can be deficient in producing the desired results. While the direct and indirect methods should produce the same CFO in principle, the following conceptual and practical problems can detract from the validity of the indirect method:

- Ambiguity in the definition of "operations."
- Diversity in reporting practices.
- Impact of changes in the reporting entity on the noncash current accounts.
- Use of absorption costing in accounting for manufactured inventory.
- Measurement of current portion of long-term leases.
- Reclassifications between current and noncurrent accounts.

Since these problems always are present to some extent, the indirect method seems at best to produce an estimate of CFO which differs from actual CFO by an unknown amount of error. Clearly of concern to individual analysts, these problems also contaminate the data used in research studies employing the indirect method. The way out of this quagmire, it seems to us, is obvious. The FASB should first refine the meaning of operating activities and then, if a cash-based SCFP is to be required, insist that reporting companies show cash provided by operations in a schedule of cash receipts and payments as called for in the *direct method.*

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THE ACCOUNTING REVIEW
Vol. LX, No. 2
April 1985

BOOK REVIEWS

Harvey S. Hendrickson, Editor

EDITOR'S NOTE: Books for review should be sent to Professor Harvey S. Hendrickson, School of Accounting, College of Business Administration, Florida International University, Miami, FL 33199.

(The policy of the *Review* is to publish only those reviews solicited by the Book Review Editor. Unsolicited reviews will not be accepted.)

ROBERT N. ANTHONY and JAMES S. REECE, *Accounting: Text and Cases*, Seventh Edition (Homewood: Richard D. Irwin, Inc., 1983, pp. xxvi, 947, $28.50).

ROBERT N. ANTHONY and JAMES S. REECE, *Accounting Principles*, Fifth Edition (Homewood: Richard D. Irwin, Inc., 1983, pp. xvii, 646, $24.95).

In their own way, each version of these established texts is a genre of one. The title of the senior book, *Accounting: Text and Cases*, is instructive; it consists of text and cases only. The second, *Accounting Principles*, duplicates the first except for the cases; in fact it has no assignment material whatsoever. But a companion volume, *Accounting Principles Workbook*, containing questions, problems, and cases is available as a supplement.

These latest editions, like those before, are targeted primarily at "required 'core' courses in accounting" (p. vii) at both the "*upper* undergraduate level and in graduate programs" (p. viii, emphasis added). (The fifth and third editions were reviewed [October 1976, pp. 936–938], and the sixth edition received a commentary [April 1980, p. 383].)

The suitability of either text for a course is a function of several factors; one of the most important is the objective. If the course is intended more as the first in a sequential accounting curriculum—the preparer-oriented, methods and procedures approach—one can do better elsewhere; these are not the strengths of *Principles* or *Text and Cases*. Instead these texts are aimed at the "user," decision-making, end of the market, where the focus is more on concepts and applications with correspondingly less attention to mechanics. Indeed, T-accounts and worksheets are infrequent and used only as a pedagogical tool, not as part of a methodology to be learned for its own sake.

Both books have 27 chapters in the current editions—one introductory followed by 13 on financial reporting and 13 on managerial accounting—up from 23 in the prior edition. The change is a net result of consolidating some chapters, splitting others, and some expansion. The seventh edition has 121 cases, an increase of ten, ranging from one to eight per chapter. Almost 20 cases are completely new, plus many of the previous edition have been revised, renamed or, with the rest, updated. Those deleted were primarily pseudo-cases of the armchair variety, structured more like problems. Some have been replaced in kind, some not. The classics remain—e.g., Birch Paper Co., Empire Glass Co. (a retitled "café" case now on its third alias), and several others.

The financial reporting segment continues to set an ambitious pace. Certainly, the breadth of topics exceeds that of any other—e.g., a separate chapter on consolidated statements and extended discussions on foreign currency translations, leases, and deferred taxes. Admittedly, some items are more described than explained—e.g., common stock equivalents, pension accounting, even group depreciation and treasury stock—but the overall presentation should allow the student, at the end, to read and understand financial statements at the level of an informed layman. Curiously, this has not seemed to be the goal of other introductory texts; yet anything else is incomplete. Anthony and Reece are to be commended for continuing to fill an otherwise embarrassing void.

Several improvements in this section should be noted. The discussion of inflation accounting as well as that of foreign currency translation are much improved and updated to incorporate FASB Statement No. 33, plus No. 8 and No. 52, respectively. (Unlike many authors, Anthony and Reece are not reluctant to introduce students to the authoritative literature. No less than 25 standards are referenced specifically.)

Occasional differences of opinion remain. For example, explanation of the effective interest method of amortizing bond premiums and discounts is placed in an appendix but is hardly optional reading for students encountering this material for the first time if the attendant chapter is to be understood. Moreover, in a few cases, issues are raised which received little or no attention in the text—e.g., zero coupon bonds, debt for equity swaps, and defeasence. The case method, though, is inherently untidy, a seeming weakness that is in fact a strength.

The cost/managerial accounting section has been substantially unbundled. Product costing, standards, and variance analysis are now covered in three chapters, rather than two as previously. A former chapter on responsibility accounting has been split into one on structure and another on process. A new chapter, on the taxonomy of costs, closes the text. This different-costs-for-different-purposes discussion might have been better positioned earlier, perhaps just after the chapters on product costing and just before those on planning and control. Still, it is a welcome addition. As in the financial accounting section, where many topics are included, some necessarily will be brief, and not to everyone's satisfaction. For instance, process costing begins and ends with one method (weighted average) in one setting. At another point, the disposition of overhead variances is described but not demonstrated. But choices had to be made.

On balance, this series continues to mature gracefully. This reviewer has only one concern, and that is on the pedagogical level. While numerous descriptive examples are included throughout, the texts are not strong on visuals. Part of this is due to the continued one-color format (although the page size has been agreeably increased). But the text has barely more than 100 illustrations and the reader is sometimes left with the feeling that an example either needs an illustration or is being used in place of one.

This is a rich product. To glean its benefits, the instructor should be comfortable with the case approach (for *Text and Cases*) and, for either book, the student should have, or develop, a reasonable tolerance for ambiguity. The authors do not shield the reader from controversies in the profession. This is to their credit. The text is well written and well designed. It should continue its previous success.

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SHIGEO AOKI, Editor, *Research in Cost Accounting* (Tokyo: Chuo Keizai-sha, 1981, pp. ix, 253, ¥2,600, published only in Japanese).

Japanese management is discussed extensively these days. It follows that many should be interested in Japanese cost accounting or management accounting, an element of the Japanese management system. As the editor states in the preface, the purpose of the book is to indicate the main themes of cost accounting research, mainly in Japan, with due regard to its historical development.

This book is divided into three parts. Part One surveys the development of cost accounting research in Japan and the related literature. In Professor Aoki's view the development before World War II was influenced chiefly by research in Germany, but in the post-war period by research in America. The development in Japan during the post-war period owes a lot to literature such as the AAA's "Report of the Committee on Cost Concepts and Standards" (1951) and "Tentative Statement of Cost Concepts Underlying Reports for Management Purposes" (1955), and the NAA's research series published in the 1950s and early 1960s. Moreover, influenced by the U.S. trend since the 1960s, Japanese researchers have paid attention to the application of mathematics, statistics, decision theory, behavioral science, information economics, and other disciplines to cost accounting and management accounting problems. Concurrently, many Japanese companies have emphasized cost accounting as a means to eliminate waste and encourage cost control during the post-war recovery period, and as a means of fostering economic growth in the rapid expansion period in the 1960s and '70s. This is why cost accounting researchers have emphasized the managerial approach.

Part Two of the book puts much weight on cost accounting for management. It surveys the appropriate literature and summarizes the major themes of Japanese cost accounting research. It consists of the following sections: Introduction to Cost Accounting; Cost Accounting Procedure; Cost Accounting for Management Control; and Cost Accounting for Managerial Decisions. The topics in the last two sections are Responsibility Accounting; Standard Cost Accounting; Break-Even Analysis and Cost Behavior; Direct Costing; Budgeting; Market Cost, Incremental Analysis, and Managerial Decisions; Pricing; Accounting for R & D Cost; and Capital Budgeting. As should be noted from these headings, the application of management science, behavioral science, and other disciplines is not sufficiently surveyed. More could have been said about research in these areas. Part Three includes a detailed bibliography.

This book is neither a text nor a research monograph. Rather it is a guide for cost accounting students who are attempting to write a paper on cost accounting. It is edited by Professor Aoki, former President of the Japan Accounting Association, and succeeds in summarizing concisely the past or traditional themes of Japanese cost accounting research.

This book is not without a shortcoming. In the reviewer's opinion, it should have pointed out the new directions of cost accounting research. The environment of the cost accounting system has changed greatly both in the United States and in Japan, and the traditional cost accounting model has become obsolete (e.g., see Kaplan, THE ACCOUNTING REVIEW, October 1983, pp. 686-705). But this shortcoming does not detract from the usefulness of this book.

In conclusion, this book would be good supplementary reading for accounting students at large and especially useful to students studying cost or management accounting in Japan, where a miraculously high economic growth rate has been accomplished. Unfortunately, its current availability only in Japanese restricts its usefulness to readers of that language.

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DENNIS R. BERESFORD, LAWRENCE C. BEST, PAUL W. CRAIG, and JOSEPH V. WEBER (Ernst & Whinney), *Accounting for Income Taxes: A Review of Alternatives* (Stamford, CT: Financial Accounting Standards Board, 1983, pp. ix, 156, $6.00).

This book was prepared to assist the Financial Accounting Standards Board (FASB) in its initial research effort by explaining the broad issues involved in accounting for income taxes and by presenting a neutral discussion of the alternative accounting methods described in the literature. Whether it is helpful or has an influence on the FASB may be reflected in future pronouncements, but it is recommended reading for the practitioner or academic who desires to understand the issues involved in accounting for income taxes. The authors have done a thorough job of identifying issues and summarizing the arguments that support various accounting treatments. Although many would like the authors to take a position or to address various implementation and political issues, to do so would not be consistent with the objective of the book.

The book is well written and organized in a logical manner that facilitates understanding the fundamental issues. The authors first address the question of whether to allocate interperiod income taxes and then, assuming allocation is desirable, they discuss how to allocate and disclose income taxes on the financial statements. They have included separate chapters on accounting for the investment tax credit and for net operating losses, but they do not address issues other than those relating to the federal income tax. For instance, they do not discuss accounting for foreign, state, or franchise taxes or for taxes among members of a consolidated group.

These omissions do not detract from the clear, concise explanation of the basic issues. Indeed, the use of nontechnical language and examples gives strength and the inclusion of additional material might only detract from achieving the objective. Although the authors profess to ignore implementation issues, they briefly discuss the United Kingdom experience with a new treatment of income taxes.

The book has ten chapters on accounting for income taxes, one appendix that gives a brief historical review of accounting for income taxes, and another that has quite a complete bibliography. Several chapters are reinforced with a listing of selected references for additional research.

In sum, this is an excellent reference book on the fundamental issues in accounting for income taxes. Although the authors have omitted discussion of various ancillary issues and do not analyze the literature, the book contains an excellent summary of the issues and alternatives in accounting for income taxes. With the possible exception of a chapter on discounting deferred taxes, the authors do not advocate any particular alternative, but leave the reader to decide the issues on their relative merits.

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THOMAS J. BURNS, Editor, *Doctoral Programs in Accounting* (Columbus: College of Administrative Science, The Ohio State University, 1984, pp. xv, 494, free upon request).

Most faculty who become involved with doctoral programs have at one time or another worried over questions such as: How do we attract bright and motivated candidates, provide them with an adequate level of financial support, and leave them with sufficient time to meet the requirements of a rigorous doctoral program? How do we motivate faculty to become involved with the program? How do the philosophy and requirements of our program compare with those of other institutions? Motivated by the scarcity of literature and formal exchanges on these issues, the American Accounting Association and the Ohio State University sponsored the "first time ever" (p. xi) conference on doctoral programs in accounting. The results were published in this volume, which consists of 16 papers, plus commentaries and discussion by representatives of the 56 participating universities. Together, they provide a cross-section of views on the above questions and related issues. For the most part the papers are based on the personal experiences of the authors, although a few present a more formal analysis of data.

The papers are grouped into five categories. The first includes two papers on program environment. Dietrick, Alderman and Sayers present survey data on the perceived importance of certain variables in selecting a doctoral program, identifying and developing a dissertation topic, and obtaining outside funding. Campbell and Hermanson, using data from a previous study, report on doctoral program productivity by school and region, and provide comparative data on GMAT and GPA minimums, tuitions, and doctoral stipends. A potentially disturbing finding is that in the last year of their study (1981), the admission requirements of the top producers of doctoral degrees were lower than average; but 1981 was counter to the general trend and, according to the authors, was based on data that were "probably the most suspect of any that we have" (p. 52). Two appendices to this paper and a separate appendix by Lammers provide a variety of comparative data on doctoral programs.

The second category includes papers on program problem areas. Smith emphasizes the importance of attitude to a correct admission decision. D. Jensen's paper argues that broadening and refining advising skills is one of the surest paths to program improvement. The discussion following this paper provides an interesting look into different universities' approaches to a number of problems. Imhoff's paper deals with suggested causes and remedies for the ABD gap. The section is concluded with a plea by Sollenberger for increased minority recruiting.

The third section is an *ad hoc* selection of special subject areas. Bailey and Meservy discuss minimum computer skills for students in a doctoral program. Felix suggests that auditing experience is necessary for some, but not all types of research in auditing. In commentary, Elliott offers the counter-view that without experience, auditing research will be tool-bound. Since Elliott is a partner with Peat Marwick, it would have been interesting to learn what portion of that firm's sponsored research projects have been conducted by researchers without auditing experience. In other papers, Tomassini argues that behavioral researchers should play a broader role in providing general knowledge about human behavior, and Boley and Outslay provide data on programs with a concentration in taxation.

In the next section on program finances Shank argues convincingly that the important deficiencies in economic incentives are at the beginning of doctoral studies rather than at the professorial level. Myers and Weil provide some information on the successful fund-raising program at the University of Chicago. A handout originally prepared for Chicago doctoral students (reproduced in an appendix) contains valuable advice for any doctoral student.

Section V is on program research. Mock and Lacey question whether the convergence of doctoral programs to a heavy research emphasis serves the market well. The paper by Koch, Merino and Berman, which reports that over half of accounting professors never publish, is cited by Mock as some evidence in support of a teaching-oriented doctoral program. Faculty and doctoral students alike will be interested in reading Dopuch's assessment of current topics and their potential for future research. Ijiri's brief journey through the maturation process of an accounting student is worthy of being read by anyone. His paper presents a counterpoint to the view reported by Shank that accounting is less intellectually challenging than other business disciplines. Appendices to this volume provide reprints of previously published articles on doctoral program rankings and information on doctoral grant programs.

The primary audience for this book should be faculty with doctoral program responsibilities.

although prospective and current doctoral students also should find much of interest here. While many of the ideas presented will not be new to faculty with some experience in doctoral programs, something is gained by a reconsideration of views and policies that is likely to be prompted by the papers, commentaries, and discussion that are contained in this volume.

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FREDERICK D. S. CHOI and GERHARD G. MUELLER, *International Accounting* (Englewood Cliffs: Prentice-Hall, Inc., 1984, pp. xvi, 525, $28.95).

The current volume appropriately bears a different title than the original book, *An Introduction to Multinational Accounting*, 1978. The earlier volume (reviewed January 1979, pp. 245–246) was a pedestrian effort compared with the new text which is a unique work, different from any other offering in its field. Its content is a well-balanced mix of theory and practice and its approach is unbiased as to different accounting methodologies.

Rather than presenting the differences among accounting methods used in various countries, this text delves into the reasoning behind such differences. By doing this, the authors present controversial arguments to support the various methods and only incidentally express their preferred approach. Their methodology requires a comprehensive examination of the philosophic and cultural foundations that lead to differing accounting usages.

Although this results in an unbiased presentation of the material, it presumes that the student has a solid understanding of accounting principles. The effect of this approach is to allow the reader to determine whether preferred principles have been used.

The authors have taken the liberty to insert many quotations and excerpts from other authorities, sometimes presenting them as arguments for two approaches to a topic. This technique adds to the breadth of the subject matter. The material is divided into twelve chapters. Some of these are titled in familiar terms such as inflation, currency translation and transfer pricing, and taxation. Others are departures from the usual approach taken by texts on the subject. Conceptual patterns are discussed at length; managerial accounting is given a full chapter; consolidation practices are treated in depth; and several other topics usually neglected are well represented. Unfortunately, some engrossing topics are not developed, e.g., the reasoning behind use of the gearing adjustment in the United Kingdom. This interesting approach merits broader treatment. One other flaw is the lack of investigation into the accounting problems of developing countries. Dr. Adolf J. H. Enthoven and others have written copiously on this subject and its inclusion in a volume on international accounting merits more attention than is given here.

On the other hand, the authors state at the beginning of the volume that their coverage does not encompass subjects other than accounting. Legal, political, and cultural discussions are kept to a bare minimum. Each chapter concludes with a selected bibliography, a group of stimulating discussion questions, exercises, and a case study. These additions to the text make the book especially adaptable to a variety of learning levels that can be selected at the instructor's discretion.

If the authors intended to stimulate the urge for greater research and pique the imagination of the reader, they have done a masterful job. But users must realize that a strong background in accounting and some knowledge of the international environment are necessary for full appreciation of this work.

As stated in the preface, this volume is written for the upper-level undergraduate and graduate student as well as a reference for the accounting practitioner. Its contents are stimulating and suggest many avenues for further research. The serious student of international business will find that it provides many insights into the logic of accounting variations among nations. But as a reference manual for the accounting practitioner engaged in international accounting this work is of questionable value. The format obviously is structured for academic use and does not contain sufficient detailed or "nuts and bolts" material to meet the requirements of a reference manual.

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EUGENE H. FLEGM, *Accounting: How to Meet the Challenges of Relevance and Regulation* (New York: John Wiley & Sons, 1984, pp. xviii, 261, $29.95).

The growing proliferation of rules in financial accounting is a situation that has received much attention in the accounting literature. Eugene H.

Flegm, assistant comptroller at General Motors, has added another work to this subject. It is unique because it views the development of rules-oriented accounting from the perspective of a managerial accountant.

Flegm examines the current state of financial accounting through a wide-ranging historical, critical analysis. Although he touches on many issues, his major concerns seem to be threefold: the increasing specialization of accountants as interpreters of rules; a shift away from historical cost toward current value accounting; and a growing threat of more governmental regulation. He explores the emergence of those problems through separate historical analyses of accounting in general, standard setters, the public accounting industry, and the FASB, in particular.

Flegm's overall historical perspective is particularly interesting. He argues that accounting concepts originally were developed by managerial accountants to meet their operating needs. (But to buy his argument in its entirety, one has to accept his implicit premise that the early entrepreneurial and venture capital accountants were also managerial accountants.) During the 1920's and 1930's, accounting concepts increasingly were developed to meet the needs of auditors, rather than managers, and managerial accountants were "[g]enerally minding their own business" (p. 76). Ultimately, these auditing-based concepts lost their relevance for managerial accountants, and they began "to impinge on the day-to-day accounting for transactions by managerial accountants and affect the ways of actually doing business" (p. 90).

Flegm's basic hypothesis that developments in financial accounting affect managerial accounting will surprise the many academic accountants who presume that the two activities usually are separated. Part of his argument here involves increased record-keeping costs, but he also is arguing that contemporary accounting standards, especially the FASB pronouncements, are directly changing internal accounting, usually for the worse.

He sees no end to this situation in the forseeable future. Increasingly complex reporting rules and income tax requirements are making CPA firms a growth industry, so their influence is ever-widening. But episodic outbreaks of major corporate frauds keep threatening the CPA firms with more government regulation and crippling lawsuits. To avoid those outcomes, the CPA firms are seeking safety by working with specific rules rather than general concepts.

Flegm is concerned about the nature of many of the specific rules promulgated recently, which will not be detailed here; and he is also apprehensive about two general developments, the shift toward current value accounting and a growing emphasis on the predictive power of accounting data.

Flegm emphatically opposes inflation accounting, a view which he says is shared by most managerial accountants. He believes that it is too "subjective" and that its benefits have never been demonstrated. Given the generally subjective nature of managerial accounting, his opposition to current value accounting on that ground is curious. In any case, he believes that LIFO inventory accounting and ACRS depreciation guidelines can handle the brunt of inflation problems, and accordingly, historical cost is a perfectly adequate basis of accounting.

Flegm also opposes a move towards making financial accounting data more predictive. He asserts instead that financial accounting should be "attestory," i.e., it should provide evaluations of the reasonableness of past decisions; but that viewpoint seems to be his own, rather than the consensus of financial statement analysts. Flegm postulates that current value accounting is a consequence of the emphasis on predictability, so he seems to be rejecting predictive power to defend historical cost accounting.

At the end, Flegm proposes that traditional, objective accounting be retained but that it be supplemented with more qualitative and narrative analyses. And, most importantly, he argues that managerial accountants should take on a much more active, major role in setting accounting standards. After all, as Flegm points out, managerial accountants are also part of the accounting profession.

A certain dilemma remains unresolved. Managerial accounting, by its very nature, is a completely opportunistic, flexible discipline. Managerial accountants are free to use whatever techniques and data suit their purposes. Do they really want to risk that freedom by becoming directly involved in the setting of accounting standards?

Overall, Flegm's book is an intriguing work that deserves a wide audience among academic and public accountants. The historical analyses are the most interesting feature of the book, and although they really do not introduce any new facts, their managerial accounting perspective sheds new light on how we have come to our present impasse in financial accounting. Accordingly, this book might be a useful supplementary reading in advanced level accounting courses.

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Yuji Ijiri, *Accounting Structured in APL* (Sarasota: American Accounting Association, 1984, pp. xiii,, 151, $8.00 paper).

The issue of computers in accounting education is thorny and controversial. More novel technologies already seem to be available than one person can master; these include different programming languages, various database systems, computer networking, and new personal computers. Yet undoubtedly many more are coming. Today's computer-based accounting curriculum can be quickly outdated by new technology. If computers are indeed indispensable in actual accounting practice, then how can the next generation of accountants be prepared to adapt to these rapidly occurring changes? This book provides an innovative answer to this vital question: to structure accounting processes algorithmically.

An algorithm simply is the way that a computer solves a problem. Thus, in theory, knowledge of a specific programming language is not needed to express an algorithm. But the author likes APL (*A P*rogramming *L*anguage) for two reasons. First, APL is a special language designed for array processing; thus, for processing accounting data, that by nature basically are arrays, APL is convenient and powerful. Second, APL is efficient—its expressions are concise; one code does what many statements are required to do in other programming languages. Thus, the book uses APL to study and demonstrate the algorithmic representation of basic accounting processes.

Since the author assumes that the reader has no prior knowledge of APL, a good deal of the book is devoted to it. The first four chapters give a concise yet illuminating introduction, using depreciation, accounts receivable, interest computations, and sales analysis as examples. The remaining chapters include a discussion of the double-entry bookkeeping system and the historical cost principle. The essence of the book is in Chapter 6, where three basic APL operations are defined that cover a wide range of routine accounting activities. These operations, with some modifications, then are applied to more complex accounting processes: current cost and revaluation, price-level adjustments, foreign currency translation, basic actuarial mathematics, and pension funding.

The book's objective is accomplished well: the many accounting processes are expressed in APL algorithms, and these algorithms are tested and ready to be executed. One minor problem is that none of the programs are documented. This may cause inconvenience for some readers, since APL is not a particularly easy (user-friendly) language.

The author also took quite an interesting approach to develop the monograph. It consists of dialogues among three persons: a professor, a computer science student, and an accounting student. Important concepts are highlighted and emphasized effectively by using a conversation question and answer approach.

In summary, this is an innovative book that emphasizes the use of algorithms in accounting. It would be useful to anyone interested in implementing accounting procedures on computers.

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Sharon M. McKinnon, *The Seventh Directive: Consolidated Accounts in the EEC* (Brentford, Middlesex, England: Kluwer Publishing Limited and Arthur Young International, 1984, pp. 392, £19.50).

This book provides an excellent "road map" of the history of the Seventh Directive, its provisions as enacted, and the future direction the member states may take in aligning their financial reporting practices with the Directive.

The map works in several ways. First, it "translates" the Directive's legalese into English (not American). This is a commendable achievement, considering statements like "any subsidiary undertaking of a subsidiary undertaking shall be considered a subsidiary undertaking of the parent undertaking which is the parent of the undertaking to be consolidated" (Article 3).

Second, McKinnon describes the roadblocks that delayed the passage of the Directive, such as the definition of the group. On one side was the economic control position which stressed the unified management approach. It was opposed by the advocates of the legal control concept. The latter idea won, after appropriate provisions were made for such hybrid groups as Unilever, Philips, and Royal Dutch/Shell.

Third, the book explains and analyzes the major provisions of the Directive, pointing out alternative roads leading to the goal of consolidated statements, albeit with different balances in some accounts like goodwill. It also points out stretches where the road is only sketched in, such as in the treatment of the excess of the subsidiary's fair value over the parent's cost.

The author also illustrates the goal of the journey, namely a set of consolidated financial statements, prepared for both the purchase and pooling methods. The example includes a list of the elimination entries with good explanations and supporting computations.

To show the different routes member states must travel to conform with the Directive, the author includes a chapter for each member country that describes its business environment, accounting law and practice, and the immediate impact of the Directive, and that draws conclusions on the probable effects of the Directive on that country's practice.

To round out the discussion, the author compares the Directive to appropriate International Accounting Standards. To help the reader refer to legal provisions, the book contains the complete text of the Seventh Directive and, due to frequent citations, of the Fourth Directive on corporate financial statements. Unfortunately it does not contain an index. Thus the reader wastes time looking for specific topics.

The book was commissioned by Arthur Young International and edited by Alan D. H. Newham, an Arthur Young manager in London. The firm's cooperation is acknowledged in the author's preface and by the inclusion of its name on the title page. Thus, the book will be of most value to accountants who must prepare or audit financial statements of groups that include companies organized in an EEC country.

It also would be useful as a supplemental text in international accounting courses to familiarize students with the diversity of European accounting practices and with the problems encountered in the EEC's harmonization efforts.

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JOHN F. NASH and MARTIN B. ROBERTS, *Accounting Information Systems* (New York: Macmillan Publishing Co., 1984, pp. xix, 546, $30.95).

Probably most accounting faculties are concerned about what their accounting information systems (AIS) course should cover. This indicates that AIS continues to be an evolving and changing area. Course content variables include questions as to the level of programming skills (some versus none), conceptual level (practical versus theoretical), and systems orientation (technical versus user). The concern includes whether this course should be an introduction (survey), a second course for those with slightly more serious interests, or some combination.

On one level the authors of this book recognize all of this and "provide a balanced coverage of all the relevant material" (p. vii). More than enough subject chapters are available to give the instructor a selection for his/her course. But those who consider the term "balanced" to be a euphemism for "smorgasbord" or timidity to choose one clear path or another would misjudge the quality and structure of this book.

The author's choice is toward a user orientation with an emphasis on the practical aspects of accounting systems. Theoretical concepts are discussed briefly and for the most part in nontechnical language. The book does not require a knowledge of programming skills. It could be used in an introductory survey course and/or a second course for those interested in a relevant, practical coverage of accounting applications. The authors' approach is comprehensive and balanced. The book could be used for two courses, especially for those designed for short time frames. At a semester school the 22 chapters may be too much even in a four credit-hour course. But Section II, Tools and Techniques in Information Systems (Chapters 4–7) and Section III, Computer Information Systems (Chapters 8–11) can be dropped or reviewed lightly if the student has had an introductory information processing course. This would leave 14 chapters that could fit nicely into one semester.

The book is organized into six sections, each having three or four chapters. The introductory chapters of many texts are ineffective because they lack a focus and have an excess of superficial generalities, but that is not the case in this text. Instead it is written in a readable and pleasantly direct style. It has appropriate, specific examples and terminology throughout. Because of this and because the authors effectively introduce an accounting application orientation into the basic computer systems material, this reviewer recommends assignment of the first three chapters even if students have had an introductory survey course.

In some texts, the section on development of information systems dwells only on "information systems" concepts and terminology. But here the authors consistently show their commitment to the accounting in AIS. Use is made of accounting examples in textual explanations, tables, and flowcharts. For example, the chapter on systems analysis includes a table used in evaluation of information systems. The table shows "existing" and "desired" applications for accounts receivable, accounts payable, payroll, cost estimation, inventory control, and general ledger.

In the section on control of information systems, the auditing AIS chapter is one of the best efforts this reviewer has seen on the topic. It includes discussion of audit risk, computer audit techniques, and generalized audit software. Also included are examples of specification sheets for generalized audit software from one of the large CPA firms. The authors make an interesting and correct distinction in this chapter; it is auditing of AIS that we in the accounting profession are qualified to do by way of aptitude and training. Many textbooks refer to this as EDP auditing which remains, even today, the distinct province of the professional trained in computer information systems. But the authors blur some of this distinction by heading a section within this chapter "Approaches to EDP Auditing" in which the terms "auditing around the computer" and "auditing through the computer" are discussed. To their credit the authors reject these terms as too simplistic and suggest instead the terms "auditing with" and "auditing without" the computer.

In the final section the authors have adopted the transaction cycles approach. They provide an overview, the structure, and the internal controls for each of the three cycles. Presented are tables showing input, files, and output for all major related subsections of each cycle. Included are numerous document and related computer processing flowcharts. Representative and real examples of input forms (for example, a Winn-Dixie Store's purchase order form) and output reports (for example, a cash requirements forecast) are shown.

Of additional note is the quality of the questions and short cases at the end of each chapter. The Instructor's Manual also is well written; it provides many charts, graphs, and advantage-versus-disadvantage type tables which will enhance presentation and facilitate discussion.

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Wallace E. Olson, *The Accounting Profession, Years of Trial: 1969–1980* (New York: American Institute of Certified Public Accountants, 1982, pp. vi, 307, $20.00).

This volume is a sequel to the two volumes entitled *The Rise Of The Accounting Profession* written by John L. Carey and published by the American Institute in 1969 and 1970. Reviews of these two volumes appeared in The Review (April 1970, pp. 391–393, and April 1971, pp. 415–417) and should be consulted to acquire a useful perspective on this volume.

Mr. Olson's volume is an important and useful summary of the AICPA institutional activities written from the viewpoint of the Institute's Chief Staff Officer during the period covered by the book. For those who acknowledge that the role and influence of the American Institute is a necessary element in understanding professional accountancy's role in our economic order, Olson provides first-person accounts of events in his characteristically candid, often blunt style, which is refreshing but in at least one instance, a bit troublesome. In particular, the Institute halted distribution of the book temporarily in 1982 to insert a clarifying statement that is affixed on the copyright page and dated November 1, 1982. With this note as an indicator, the reader can look forward to similar straight-forward and controversial comments by an author who tells it like he sees it.

The book has fifteen chapters, two appendices and a comprehensive index. The chapters are topic oriented, and a specific topic is developed chronologically. The chapter topics include: 1. Overview of the period, 2. Impact of litigation, 3. Federal government examination of the CPA profession, 4. Accounting standard setting, 5. Auditor responsibility, 6. Ethics, 7. Division for CPA firms, 8. Peer review, 9. Licensing, 10. Specialization, 11. Management advisory services, 12. International accounting, 13. Professional education, 14. Other matters (public relations, publications), 15. Conclusions.

Educators may consider several segments as must reading, but this reviewer considers Chapter 13 on Professional Education to warrant reading and perhaps re-reading to elicit an understanding of the background issues on professional schools, programs, and the AICPA attitude toward post-baccalaureate education. Most notable is Olson's comment on the impact of accounting accreditation on separate schools of professional accounting: "Thus, the AICPA decided to tolerate, if need be, the accreditation of A- and B-type programs if the C-type programs were designated as professional accounting programs. Implicit in this decision was the virtual abandonment of an AICPA drive for the establishment of separate schools of professional accounting, which were strongly opposed within the AACSB" (p. 258).

Other striking comments are contained in Chapter 1, the overview chapter. For example, Olson expresses his view as to the role of the profession and the maturity which it achieved in the 1970s. This maturity, he notes, was achieved by a fuller realization of the responsibilities imposed by the securities acts of the 1930s. Until the 1970s, he asserts, "the profession had tended to devote most of its attention to the needs of management" (p. 1). One cannot but contemplate the significance of this remark in light of the literature of auditor independence published by the Institute during the 1960s. Does Olson contend that management and not the interests of the investing public were, in his view, the fundamental concern of the CPA profession before the waves of litigation of the 1970s? Why make such a remark and invite a challenge to the traditional position of the AICPA on professional independence? Olson's typically frank discussions of issues—the inauguration of peer review, development of the public oversight board and sections for public practice firms—affords every reader an insider view of critical events of the period. Olson expresses an unflinching belief in market forces and professional self-regulation as the means of providing the quality level of service and self-restraint to ensure a role for the profession.

This volume belongs on the shelf of college and university libraries as a starting point, not as a single point of reference, to provide the basis for discussion and understanding of the role of the CPA profession in our economic order. Schools that offer seminar courses on professional accountancy, professional ethics, and the services offered by CPAs should adopt this book as a text to acquaint students with the institutional framework and challenges of CPA practice. Mr. Olson is to be thanked for his efforts, efforts that others in the modern CPA profession seem less willing to make, to document the roles of individuals and undercurrents of episodes that produced an institutional structure for the CPA profession of the 1980s.

The role of a participant *qua* historian, which Olson fills in this work, dictates that the reader consider the limitations on the author's objectivity. To an important degree this is a diary and an autobiography as much as it is an institutional history.

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WILLIAM E. PERRY, *Ensuring Database Integrity* (New York: John Wiley & Sons, 1983, pp. ix, 378, $39.95).

Audit and control activities relating to databases are a significant organizational concern. Both independent auditors and internal auditors may evaluate selected database controls as part of financial audit activities. Special audits may examine additional database controls and evaluate database integrity. Although the body of literature on databases is large, the literature on database controls and database audit activities is fairly limited.

In the database controls and audit literature, items can be classified by their major intended use: for acquiring general knowledge, for classroom teaching, for reference, and for audit practice. This reviewer classifies the Perry book as primarily to support audit practice, but it is also a useful reference. Its use as a textbook is limited by its practitioner/reference orientation. For example, 106 figures are devoted primarily to lists, summary tables, and checklists. These figures take approximately one-third of the 306 pages of chapter content. In addition, 66 pages of appendices list database controls, database audit tools, database terms, references, database evidence, and database risks. As an example of useful reference material, 102 activities subject to audit and control (with some redundancy in the classification) are listed in Appendix A with a description of each control, evidence as to the control, and how to collect the evidence.

The format of tables, lists, and checklists in the chapters and summaries of these in the appendices make a useful format for a practitioner; it is a difficult format to use in teaching because of its high redundancy. The book appears to have been designed for practitioners, not for students, since it contains none of the case or question material that characterize a textbook. But it does have aids to self-study; these include the liberal use of summary tables and key concept statements in boxes in the text.

Given the *caveat* that the book was not designed for classroom use, it represents a useful compendium of control and auditing information relative to databases, especially general controls. It provides an elementary introduction to database concepts. The four sections illustrate the relative emphasis of the book.

Section	*Title*	*Number of Chapters*	*Pages*
1	Developing a database strategy	1	20
2	Planning the database audit	3	74
3	Conducting the audit	8	200
4	Assessing the database (audit opinion)	1	12

The chapters on conducting the audit follow a somewhat traditional audit logic: auditing database organizational structure, documentation, development, access controls, operations, backup/recovery, and integrity. The strength of the book is its emphasis on traditional controls based on organizational structure, job design, and work procedures. The weakness is the somewhat cursory treatment of the relevant software technology, especially the technology for control and integrity in databases and for auditing databases.

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MICHIHARU SAKURAI, *Managerial Cost Accounting: Research on a New Framework of Cost Accounting,* Second Edition (Tokyo: Chuo Keizai-sha, 1981, pp. xviii, 660, ¥4,300, published only in Japanese).

This book serves as both a textbook and a reference book for accounting majors. It is a result of the author's efforts to enrich traditional theories and practices of cost accounting and embrace different approaches to cost accounting. But to the reviewer's regret, it essentially is a textbook since the author fails to present the empirical issues. The treatment of new approaches to cost accounting is not sufficient to serve the needs of researchers and undergraduate/graduate students majoring in accounting. But the text presentation and the questions raised are very appropriate for student readers.

One of the primary objectives of the author is to focus on the management aspects, the pragmatic and interdisciplinary approaches that have been lacking in the leading cost accounting textbooks published in Japan.

To make his assertions explicit in the context of a new framework of cost accounting, the author emphasizes such management concepts and techniques as linear programming, statistical approaches, ABC analysis, economic order quantity analysis (EOQ), value analysis (VA), and learning curves. He covers budgeting systems, management decision making, and capital investment decisions in a separate chapter to expand the traditional cost accounting areas.

The text is divided into 15 chapters that highlight both traditional product and managerial cost accounting subjects useful to management decisions. The 15 chapters examine the traditional issues as well as a new framework of cost accounting. The first 11 chapters introduce cost accounting principles and practices and are carefully organized to cover traditional product cost accounting. The final four chapters discuss behavioral budgeting, utility functions, and decision making.

This book is based on traditional product costing and provides readers with expanded areas of cost accounting as well as a reinforced knowledge and practical applications of many management tools.

This book, in comparison with other cost accounting textbooks authored by Japanese scholars, contains broader areas within the framework of cost accounting and places a greater emphasis on practical management uses. This would be more properly viewed as a handbook or reference book of cost accounting, because of the comprehensiveness of its coverage.

The reader who wishes to know about distribution costing, the PERT method, and social costing will be disappointed by the book, for it omits them. But the reader interested in a new framework of cost accounting, particularly the interdisciplinary aspects, will find the book helpful.

In summary, I consider this as one of the major textbooks in the field of managerial cost accounting. This reviewer recommends this book as a required reading for all graduate students taking managerial cost accounting courses or as a reference source to any person interested in the new framework of costing.

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CHARLS E. WALKER and MARK A. BLOOMFIELD, Editors, *New Directions in Federal Tax Policy for the 1980s* (Cambridge, MA: Ballinger Publishing Company, 1983, pp. xix, 381, $35.00 cloth, $16.95 paper).

This book is a collection of papers presented in January 1983 at a conference on tax policy that was sponsored by The American Council for Capital Formation: Center for Policy Research, a research affiliate of The American Council of Capital Formation. This Washington-based organization advocates pro-capital formation policies. The participants in the conference were current and past economic policy makers from Congress and the Administration, corporate leaders, economists, and lawyers. Those who presented papers and the discussants include the leading tax policy figures in the United States. The focus of the conference was a comprehensive discussion of what are felt by the sponsors to be "the most pressing federal tax policy questions facing the nation for the remainder of the decade" (p. xv). The three sections of the book address the principal challenges and solutions to the problem of federal tax reform.

Part I deals with the political and economic challenge for tax reform and contains papers by Horace W. Busby on the political environment, John B. Connally on the challenge of tax reform, Martin Feldstein on fiscal policy and Paul A. Volcker on monetary policy. This part sets the backdrop for capital formation plans to shift taxation away from saving and investment and toward the taxation of consumption. Given the broad political spectrum represented in these papers, it appears that a consensus may be emerging: the future tax system must correct problems associated with a low rate of saving and a high rate of tax on the middle class. The systems mentioned that may accomplish this objective were the flat tax, consumption-based tax, and value added tax.

The papers presented in Part II provide an evaluation of the current path of the federal tax system toward policies of capital formation. Norman B. Ture analyzes economic effects of the 1981 and 1982 accelerated cost recovery provisions passed in the Economic Recovery Tax Act (ERTA) and the Tax Equity and Fiscal Responsibility Act (TEFRA). Discussants of Mr. Ture's paper included Alan J. Auerbach, George N. Hatsopoulos, and Frederic W. Hickman. Gerald E. Auten presented a paper with an economic analysis of the 1978 and 1981 changes in capital gain tax rates. Alan Cranston, Steven R. Resnick, James W. Wetzler, and Ed Zschau provided additional proposals on tax-deferred rollovers and indexation of capital gains as well as an economic analysis of the effects of capital gain tax cuts on the stock market and on the creation of venture capital. Michael J. Boskin's paper on the role of tax policy on savings incentives concludes that our present tax system is "replete with substantial inefficiency in the consumption/saving choice and the forms that saving and investment take" (p. 110). Discussants of Mr. Boskin's paper included Edwin S. Cohen, William Fellner and W. Henson Moore. The last paper in Part II is a comprehensive analysis of the state of the corporate income tax by Arnold C. Harberger with a discussion by Robert F. Dee, Tor Meloe, Joseph A. Pechman, and Steven D. Symms. The principal conclusion reached from the analysis in this section of the book is that ERTA has been somewhat successful in encouraging capital formation and economic growth and that TEFRA was not a fundamental reversal of this reform.

Part III sets out proposed solutions to problems with the tax system that would fundamentally restructure the federal tax system. This section contains five papers: four analyze tax systems currently under study and a fifth deals with basic reform in the international tax area. The paper by Charles E. McLure, Jr. on the value added tax presents a balanced analysis of the policy issues involved in implementing this system. The four discussants of this paper, Henry Aaron, Donald V. Seibert, James M. Shannon, and Al Ullman, add a great deal of political and economic perspective to this controversial tax. David F. Bradford presents a paper intended to form the basis for discussion of the potential advantages of adopting consumption as a base for taxation rather than income. Discussion of this paper by David L. Boren, Lawrence H. Summers, and Perry D. Quick deals with additional policies, politics, equity issues, and the prospect for reform in this area. Richard Goode concludes in his paper on the comprehensive income tax that this system is a far more attractive route than either a flat tax system or a consumption-based system. Discussion of this paper was provided by William D. Andrews, Barber B. Conable, Jr., and Emil M. Sunley. A paper on a flat tax proposal was presented by Robert E. Hall and Alvin Rabushka and discussion of the analytical framework for evaluation of a flat tax, fiscal implications, political prospects, and costs and benefits of a flat tax was provided by J. Gregory Ballentine, James M. Buchanan, James R. Jones, John S. Nolan, and Bob Packwood. The final paper by Thomas Horst and Gary Hufbauer covers certain aspects of basic income tax reform in the international tax area. William E. Brock, C. E. Hussey II, Stuart M. Berkson, Daniel Patrick Moynihan, and John G. Wilkins discuss international trade, capital flows, reform priorities, and political and economic complexities involved in international tax issues.

In summary, this book can be a valuable text for a graduate tax course with a policy orientation. It also would be a valuable reference resource in libraries offering graduate programs in taxation. Overall, the book presents a balanced view of the economic, political, and equity issues involved with tax policy related to capital formation.

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DONALD A. WATNE and PETER B. B. TURNEY, *Auditing EDP Systems* (Englewood Cliffs: Prentice-Hall, Inc., 1984, pp. xviii, 584, $32.95).

This first edition text is designed for use by fourth-year undergraduate or graduate students who have completed an auditing and EDP course. The authors state their purpose is "to create a textbook that would be teachable by auditing professors and usable by auditing students and practitioners without sacrificing quality and depth" (p. xix). While the textbook is not particularly outstanding, it does offer some promise of achieving the authors' purpose.

The title should be taken literally; that is, the focus is upon the audit of EDP systems rather than the results produced by those systems. The typical text focuses upon the system as a means to an end. This text focuses overwhelmingly on the internal control structure of a computer system. While in some respects this focus is a strength, the book could benefit by expanding the substantive testing sections.

Another unique feature is the use of a number of review questions concerned with previous chapters at the beginning of each new chapter. Usually, one finds these questions at the end of chapters. This approach may distract the reader from a focus upon the objectives of the new chapter.

The first four chapters introduce EDP and auditing concepts. These form an exceptionally good review for EDP questions covered on the CPA exam. Coverage includes typical terminology, flowcharting, and general concepts of EDP control.

While the technical nature of the material lends itself to explicit definitional treatments, the textbook suffers from overreliance on definitions. The price of this is minimal use of illustrations and figures usually considered as valuable student aids.

The strongest aspect of the text is the problems and cases provided at the end of each chapter. Most chapters contain one or more comprehensive cases which do a good job of integrating chapter concepts. One case, Lava Butte, Inc., is carried through six chapters.

Another strength is the coverage of several topics of emerging importance. While many texts emphasize mainframe systems, this one presents effective discussion of the unique features of small computer systems and of third-party computer systems. The discussion is framed in terms of the audit function.

While the serious student and practitioner should find this book helpful in understanding the audit approach to computer systems, those hoping to find a practical guide to using computers in the audit process should look elsewhere.

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Frederick H. Wu, *Accounting Information Systems: Theory and Practice* (New York: McGraw-Hill Book Co., 1983, pp. xviii, 605, $28.50).

This book is intended as an introduction to accounting information systems (AIS) for advanced undergraduates or graduate students. Most of the contents are relatively easy to describe: the first half begins with the obligatory (but low priority) theory of AIS and has three chapters on this topic, next a review of data processing technology is given in three chapters, then students are exposed to systems analysis and design for two chapters that include some of the newer structured techniques. The second half of the text is less easily described: it begins with three descriptive chapters on control systems for general ledger and budget, working capital, and production and fixed assets; then three chapters on internal control; and three final chapters on planning systems including strategic planning, financial planning, and decision support systems.

Although this text offers good support for many lecture and class activities, the instructor looking for hands-on materials in micro computing such as LOTUS or other spreadsheet software will be disappointed. Similarly little material is included to support mainframe computing exercises. If students have completed an introductory data processing course, the chapters on technology are at a level that is too low. The text is strong in internal control and this should help to support students' interests in auditing.

This reviewer uses the text to supplement AIS lectures but finds that it, like competing texts, covers only part of the course objectives. The objectives not covered are concerned with the development of computing skills and related concepts. This is based on the assumption that the AIS course is the place for developing computing skills and illustrating concepts with hands-on computer exercises. These skills are at a higher level or are beyond those typically covered in the introduction to management information systems course required by the American Assembly of Collegiate Schools of Business. While agreement is not complete on the specific computing skills and conceptual materials that are most appropriate for accountants, four possible types of computer exercises are: 1. introductory exercises in using terminals and an editor on a business-oriented interactive operating system, e.g., IBM's XEDIT (Terminal Editor) and CMS (Conversational Monitoring System); 2. intermediate level exercises in programming in a business data processing language, e.g., COBOL; 3. intermediate exercises in microcomputing with emphasis on spreadsheet applications, e.g., IBM personal computers with LOTUS spreadsheet software; and 4. intermediate exercises in analysis of accounting systems, e.g., internal control cases using systems flowcharting as an analysis tool. Each of these exercises has been used successfully, but any of them could be varied, e.g., by using a language other than COBOL or using data flow diagrams instead of flowcharts.

This book does not cover, or covers in insufficient detail, the above areas of possible computing exercises. This is a significant problem for instructors since they must adopt supplementary texts and/or develop their own supplementary materials. For example, in the AIS course taught at our school, the equivalent of approximately six or seven text chapters is provided to students through means such as supplementary texts, handouts, reserved materials, and materials in the micro computer laboratory. The need for such a large amount of supplementary material illustrates that the area of hands-on exercises for development of understanding and skill in the utilization of computers is a significant weakness of the text.

In general the teaching of AIS is not in a settled state. Those professors who do not agree to the need for hands-on exercises in the AIS course should consider this text favorably. Those who see the need for supplements will find that such requirements for this text will be no more than for competing ones.

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CAPSULE COMMENTARIES

Harvey S. Hendrickson, Editor

The Commentaries in this issue are by the person indicated.

AMERICAN INSTITUTE OF ACCOUNTANTS, *The American Institute of Accountants: Fiftieth Anniversary Celebration, 1937* (New York: Garland Publishing, Inc., 1982, pp. xxi, 522, $60.00).

This is a reprint of the commemorative volume published in 1938 by the American Institute. The proceedings of the annual meeting that was held in New York on October 18–22, 1937 comprise about 80 percent of the volume and two-thirds of this (about one-half of the total volume) is devoted to ten roundtable discussions on issues, many of which continue to be important today (e.g., the extent to which accounting can be reduced to rules and standards and the education of accountants).

Included in the balance of the volume is a history of the Institute's first 50 years; three papers from the Fall 1937 New York State Society meeting (two of these deal with accounting machinery of yesterday and today), the text of the address by R. C. Carter (immediate past president of the Institute of Chartered Accountants in England and Wales) that was broadcast coast to coast by CBS radio; and other miscellaneous items such as the "Index of Registered Guests" and a list of the holders of the first CPA certificate issued in each state and territory.

This volume has much interesting reading on the concerns, issues, and problems of accounting practitioners and academicians in the late 1930's.

H.S.H.

JOHN F. BUDD, JR. *Corporate Video in Focus: A Management Guide to Private TV* (Englewood Cliffs: Prentice-Hall, Inc., 1983, pp. xiv, 210, $21.95 cloth, $10.95 paper).

This insightful book was written by a public relations executive who has received numerous awards for innovative corporate financial communications and is a pioneer in the use of video in business applications—one was to produce a 22-minute highlight version of his company's annual report and telecast it via cable television (TV) over a network of 22 stations to reach a potential 10,000 shareholders in eight states at a cost claimed to be less than $10,000.

The book explores numerous aspects of the tremendous opportunities that recently have been created by communications satellites, microelectronics and computers, telecommunications, and cable TV. The techniques discussed include direct-broadcast satellites (that transmit signals directly to home dish antennas), narrowcasting to selected audiences (with huge economies compared to traditional broadcasting to mass audiences), interactive TV (that provides two-way communications), and low-power (or mini-) TV stations (having ten to 1,000 watts of power and a range of up to 50 miles, thousands of which could be built, each serving a community or special interest groups within a community, e.g., a university or program, its faculty and/or students).

This book contains a brief section written by T. E. Gambling (Professor of Accounting at the University of Birmingham, England) who is an early and enthusiastic advocate of video presentation that he predicts will "be the principal medium for most aspects of accounting information in the future" (p. 90).

An extensive glossary, a brief but useful index, and an emphasis on introducing, suggesting, and cautioning make this interesting reading and an excellent reference for academic, corporate, municipal, and public accountants who are seeking insight into adapting modern technology to improve their learning/teaching/communicating of financial reports and reporting.

H.S.H.

JOHN G. BURCH, JR., FELIX R. STRATER, and GARY GRUDNITSKI, *Information Systems: Theory and Practice*, Third Edition (New

York: John Wiley & Sons, 1983, pp. xvi, 632, $35.45).

The reviewer of the second edition of this book (THE REVIEW, January 1982, pp. 214–215) reported using the first and second editions in systems analysis and design classes containing students from the various business school disciplines. Information systems concepts and development are treated as being independent of specific functional areas of business. In addition, the book's title, intended usage, and contents separate it from those books designated as accounting systems books.

The book is intended for use in a one-semester course by students who have at least an introductory background in computers and business. Junior, senior, or graduate standing with reasonable preparation in a business specialty should enable the student to obtain expected benefits from the book. A term project, preferably supported by an illustrative program, could enhance assimilation of the theory and methodology provided in the text. The book deals with equipment and programs in a machine- and language-independent manner.

Contents of the three major sections of the book have been rearranged some from the previous edition. They are information systems from a management or user viewpoint, data base development and design as the core of a computer-based information system, and information systems development and methodology as a way of carrying out the traditional analysis, design, and implementation.

Emphasis on regular reports to management on system design progress and the actions management could take at such times points out to students one of the realities of systems work. Chapter contents in the development methodology section are reinforced by a multi-chapter case example. Appendices deal with logico-mathematical models and computer technology in a summarized but comprehensible manner.

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EUROPEAN ACCOUNTING ASSOCIATION, *Congress Proceedings: Sixth Annual Congress, 6–8 April 1983* (Glasgow, Scotland: University of Glasgow, 1984, pp. 48, U.S. £4.00, Europe £3.50, U.K. £2.50 paper).

The European Accounting Association, established in 1976, now has over 500 members from Europe and other parts of the world. The Sixth Annual Congress held in Glasgow, Scotland in 1983 was attended by 240 academic participants from 25 countries including Australia, Canada, Japan, Libya, New Zealand, and the United States.

The proceedings include a report on the Congress, two papers presented at the plenary sessions, and only a list of the 65 papers presented on 13 topics at the four concurrent sessions.

A paper by the noted economist Alexander K. Cairncross analyzes the growing economic interdependence of nations on the one hand and government intervention on the other. It pleads convincingly for more willingness to pay the price of greater integration in the international economy.

Professor Whittington's paper is a scholarly study on the European contribution to inflation accounting ideas and practice, especially by Schmalenbach, Schmidt, and Limperg.

This small book is handsomely produced. If it had included all the papers presented or even their abstracts, much more would have been accomplished to further the Association's objective of "better dissemination of information on accounting research and pedagogy . . . " (p. 9).

LUCIA S. CHANG
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DALE L. FLESHER, TONYA K. FLESHER, and GERALD U. SKELLY, *The New-Product Decision* (New York and Hamilton, Ontario: National Association of Accountants and The Society of Management Accountants of Canada, 1984, pp. vii, 150, $14.95, Can. $10.00 paper).

When one considers that two-thirds of all new products fail, and that on the other hand some companies with good planning are over 80 percent effective in their product development, one cannot help but welcome this timely in-depth research on how 17 manufacturing firms in the United States and Canada approach the new-product decision and the crucial role played by accounting information in such a decision.

The most interesting finding of the study is the absence of a common pattern of how various firms develop a new-product planning strategy and the manner by which this strategy is operationalized once it has been adopted. The study attributes this diversity to the different hierarchical levels of the firm where the new-product idea is generated, the existence (or lack) of new-product policy manuals, the use (or lack) of sophisticated quantitative tools, and the functional area in the company that is finally responsible for marketing the new product. Other factors that contribute to this variety of approaches are: potential market share of the new product, ecological and environmental factors, governmental regulations, social goals, and idle capacity.

The greatest contribution of this study is to highlight the need for better communications between the management accountants and the marketing executives in charge of new product development. Among its specific recommendations are that marketing managers get more accounting education, that incremental costing receive greater emphasis, that life cycle models be used to develop budgets, and that accountants make more analyses of pricing alternatives.

A major weakness of the report is that its findings and recommendations are based on a limited, nonrandom sample of large firms in which the new-product decision process was ongoing and organized. But from a normative point of view, the work has to be considered a significant contribution to the literature and a potential guide to those marketing executives and accountants interested in improving the quality of their new-product decisions. It also would be useful as a supplement in managerial accounting courses.

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DON E. GARNER, *Corporate Audit Costs and Staffing: 1980 and 1981* (Altamonte Springs: The Institute of Internal Auditors Research Foundation, 1983, pp. vii, 147, $27.00 paper).

How much do U.S. companies spend on the audit function? How do the costs of internal audits compare with external audit fees? Do audit costs differ significantly among companies? Despite their importance, little systematic, readily accessible evidence has been available on such questions. The main sources of information on contemporary audit costs were occasional reports published by the Machinery and Allied Products Institute and a recent work published by Professor Wanda Wallace.

More is at issue here than mere curiosity because corporate audit cost is an essential datum in certain kinds of audit research. For example, cost clearly is an important factor to consider when exploring how market or company circumstances might affect the price, quantity, or quality of audit services.

In response to this general lack of data on audit costs, the Institute of Internal Auditors (Institute) has sponsored a study of corporate audit costs covering the years 1980 and 1981. The published report is designed primarily for its membership, to provide a reference guide for business executives wishing to compare their own company's audit costs with those of comparable companies. To this end, the bulk of the report (approximately 115 of its 147 pages) is devoted to over 100 tables of descriptive statistics. Narrative explanation is limited to 12 pages.

The report begins with a brief summary of the scope and methods of the study. The data were obtained by mail survey from approximately 400 members of the Institute, who are heads of corporate and government internal audit departments. The total number of questionnaires initially mailed is not mentioned. Included in this introduction is an explanation on how the tables can be used and interpreted. This is useful because the underlying pattern of the numerous tables is not easily discerned. Next are three very brief chapters, seven pages in total, highlighting the major findings of the study. The remainder of the report contains the many tables of figures: 95 on audit costs and 13 on internal audit department items such as size and salary levels.

The tables on audit costs summarize both internal and external audit costs; all are expressed as a percentage of sales and as a percentage of assets. More detailed breakdowns are provided by industry group and for domestic and worldwide operations. This basic pattern is repeated in five separate sets of tables containing the descriptive statistics, mean, median, standard deviation, maximum, and minimum.

The report should be useful in its stated, practical purpose of aiding audit executives in assessing their company's audit costs. Used with care, one can obtain a composite profile of the relative cost and makeup of the audit function for a major corporation. But academic use of the report is more problematical. Its major shortcoming is the lack of analysis and discussion on how the findings contribute to an understanding of significant audit issues that are influenced by cost. It also does not contain a bibliography that would enable the reader to develop a context and permit linkage of this study with previous work. Thus, the report's value for instruction or for general understanding of auditing is severely limited. Much like a census data report, its value would be as a reference source providing some previously unavailable facts on audit costs. Those looking for a secondary source of statistics on audit costs for research purposes will need to use care. The nature of the study probably limits generalizability to just those companies taking part in the survey. Furthermore, many categories within the tables represent very small sample sizes.

The report makes an important contribution to factual knowledge about corporate audit costs. It represents one of the first products of the Institute's recently established sponsored research program on internal auditing, a program that promises to add a much needed internal auditing dimension to the profession's overall audit research efforts.

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STEVEN J. GOLUB and ROBERT J. KUEPPERS, *Summary Reporting of Financial Information: Moving Toward More Readable Annual Reports,* Two Volumes (Morristown, NJ: Financial Executives Research Foundation, 1983, Vol. I, pp. iv, 150, $8.00 paper, Vol. II, pp. iv, 87, $8.00 paper).

Any changes that might make annual reports more meaningful are certainly worth considering. One possible approach is to prepare simpler, shorter reports. This two-volume study reports on an experiment with summarized annual reports.

Nineteen companies were asked to prepare shorter versions of their 1981 annual reports. The companies were allowed total flexibility. They did not have to meet GAAP or SEC requirements, but they did have to avoid misstatements or omissions of material facts. Truly, this was a golden opportunity for corporate accountants to demonstrate the types of financial statements that *they* would prefer to publish.

The essential outcome of the experiment was that these alternative annual reports were indeed shorter. They averaged 11 pages of information compared with 24 pages in an average annual report. The authors concluded that the language in the experimental reports was closer to the layman's level of comprehension, but the summary reports reprinted as examples did not seem to reflect that result. The companies condensed their annual reports in a variety of ways that cannot be detailed here, but the biggest disappointment for this reviewer is that none of the companies tried anything new. The experimental reports were essentially shorter versions of traditional annual reports.

The quarterly reports of 100 companies also were examined to determine the types of accounting information that are disclosed voluntarily. Not too suprisingly, it was found that income data are mainly reported in quarterly statements and those same data were reported in the experimental summary reports.

This study was basically descriptive. No attempt was made to get investor reactions to the alternative statements so it is almost impossible to determine the significance of it all. Anyone who is concerned about the understandability of financial statements might find this study to be of some interest. But this reviewer would have difficulty recommending it for other uses, especially since the production quality of the books is questionable here and there.

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DOUGLAS GREENWALD & Associates, Editors, *The Concise McGraw-Hill Dictionary of Modern Economics: A Handbook of Terms and Organizations* (New York: McGraw-Hill Book Co., 1983, pp. xii, 395, $19.95 paper).

This is an abridged version of the third edition of *The McGraw-Hill Dictionary of Modern Economics*. It contains about 1,100 terms from economics, econometrics, marketing, and statistics. The definitions are appropriately described as authoritative since most include "further information" references to one or more books. It would be a useful reference for accounting professors, practitioners, and students.

H.S.H.

ROBERT HAMILTON, *An Introduction to Merchandise—Part IV: Italian Book-keeping; Part V: Practical Book-keeping* (New York: Garland Publishing, Inc., 1982, pp. xvi, 231, $25.00).

This reprint contains the two parts on bookkeeping of the second edition of a six-part book that included a variety of other topics (arithmetic, algebra, negotiable instruments and foreign exchange, and foreign trade and relevant laws). Also included is a two-page piece by B. S. Yamey that was published in 1975 and that serves as an effective preface.

Hamilton was a professor of philosophy who also was known for his contribution to political economy. His work included here was published in 1788, twelve years after Adam Smith's *The Wealth of Nations.*

It clearly indicates that Hamilton also had an intimate knowledge not only of economic problems but also of business and accounting practices. His modern views on common and joint costs, cost and profit centers, and relevant data for decision-making suggest that he was very advanced for his time.

Much of this book provides useful reading for accountants interested in the financial, managerial, and/or history areas.

H.S.H.

EDWARD HATTON, *The Merchant's Magazine: or, Trades-man's Treasury* (New York: Garland Publishing, Inc., 1982, pp. xvi, 178, $22.00).

This is a reprint of a book published in London in 1695. The author states in the preface that the book was intended for general use by men of business, especially young merchants. He also argues that "arithmetick" is the foundation for both merchants' "accompts" and bookkeeping, and that the merchant must have this knowledge to understand his business. He then presents a primer on business arithmetic, business rules and practices, and bookkeeping. Topics covered include the four arithmetic functions, proportions, "vulgar" and decimal fractions, weights and measures, allowance for tare, barter and currency exchange, and simple and compound interest. The presentations include discussions, illustrations, tables, and attractive calligraphic drawings and vignettes ("curious copper cutts of the chief tables and titles") on the title pages of eight of the first nine chapters.

This delightful little book is of primary interest to students of accounting history.

H.S.H.

GEORGE S. HILLS, *The Law of Accounting and Financial Statements* (New York: Garland Publishing, Inc., 1982, pp. xii, 338, $35.00).

This is a reprint of a book published in 1957 (reviewed October 1957, p. 691). It continues to be a useful historical reference for accountants and lawyers since it was carefully researched and written with extensive footnotes, direct references to several thousand court decisions and numerous authoritative sources, a 52-page listing of cases, and a 32-page index.

H.S.H.

CHARLES T. HORNGREN, *Introduction to Management Accounting*, Sixth Edition (Englewood Cliffs: Prentice-Hall, Inc., 1984, pp. xix, 711, $28.95).

A good teaching package has been improved with this new edition. Those looking for an introductory managerial text to be used at either the graduate or undergraduate level should consider this book.

Although this edition retains most of the major revisions introduced in the fourth, some material has been rearranged.

The first twelve chapters have changed little. Process costing is now in a separate chapter. Quantitative techniques are in the only chapter in the part titled "Quantitative Methods." This material might be more useful if it were more fully integrated within the chapters. The last part of the book deals with basic financial accounting and has been rearranged from the fifth edition.

A number of criticisms noted in the review of the Fifth Edition (January 1982, p. 221) remain valid:

1. Although the cost-benefit approach is a recurring theme, other possible themes are not reinforced among related chapters.
2. One "theme" that is noticeably missing is the impact of inflation on management accounting.

The author has addressed the second criticism in more depth than in prior editions by considering the effects of inflation in the profit centers and transfer pricing chapter and expanding the coverage in the capital budgeting chapter. It is covered to a greater extent in the financial accounting section.

The problem selection is extensive, but the inclusion of more that were simple and straightforward might be beneficial. The book format is flexible. The student guide is very good and the solutions manual is more than adequate. Perhaps one of the best parts of this package is the test bank. This resource has been upgraded greatly and is now one of the best on the market. It contains a substantial number of objective, problem-oriented questions.

This text will do all that most professors will ever ask of an introductory text. It does have some shortcomings but they are minor compared to the overall benefits.

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INTERNATIONAL CONGRESS ON ACCOUNTING, *International Congress on Accounting,*

1929 (New York: Garland Publishing, Inc., 1982, pp. xx, 1,376, $112.00).

INTERNATIONAL CONGRESS ON ACCOUNTING, *Fourth International Congress on Accounting, 1933* (New York: Garland Publishing, Inc., 1982, pp. xxix, 747, $80.00).

The first book is a reprint of the proceedings of the Third International Congress on Accounting held in New York City September 9-14, 1929. Colonel Robert H. Montgomery was both President of the Congress and Chairman of the Executive Committee. The proceedings contain 65 papers; among the presenters (and their papers) are Irving Fischer ("The Thirteen-Month Year Calendar Reform"), Howard C. Greer ("Bases or Standards for Cost Computations"), Roy B. Kester ("Standardization of Balance Sheets"), George O. May ("External Influences Affecting Accounting"), and Thomas H. Sanders ("Accounting for Labor"). The papers presented were summarized in two articles in THE REVIEW (December 1929, pp. 234-246 and March 1930, pp. 70-74).

The second book is a reprint of the proceedings of the Fourth International Congress held in London in July 17-21, 1933 (reviewed March 1934, pp. 102-103). These proceedings indicate a much less ambitious agenda (only 12 papers) and reflect substantial concern for the gravity of national and international economic conditions. Among the presenters (and their papers) were A. E. Cutforth ("Exchange Fluctuations in Relation to Operating Results and Asset Values"), R. H. Montgomery ("The Auditor's Responsibility . . . from the American Point of View"), and Sir Josiah Stamp ("International Finance").

Both of these volumes have papers that would be of interest to a broad spectrum of accountants and auditors.

H.S.H.

SIR RUSSELL KETTLE, Compiler, *Deloitte & Co. 1845-1956*
Bound with
ERNEST COOPER, *Fifty-Seven Years in an Accountant's Office* (New York: Garland Publishing, Inc., 1982, pp. xi, 200, $25.00).

This reprint combines a book initially published in 1958 with a 33-page piece from the Proceedings of the 1921 Autumnal Meeting of the Institute of Chartered Accountants in England and Wales. Together they report on events in the history of two international accounting firms that were founded in London in the 19th century.

Sir Russell Kettle, a Deloitte partner from 1919 to 1955, presents an interesting report on his influential firm that now is called Deloitte Haskins & Sells.

Mr. Cooper's paper is a rambling but lively narrative on his family and the important firm founded by his brother that merged with Lybrand, Ross Bros. & Montgomery and now is called Coopers & Lybrand.

H.S.H.

ALLAN H. PESSIN and JOSEPH A. ROSS, *Words of Wall Street, 2000 Investment Terms Defined* (Homewood: Dow Jones-Irwin, 1983, pp. xi, 297, $22.50 cloth, $9.95 paper).

This volume contains a large number of terms from the language of the securities industry, most of which are familiar to seasoned investors and readers of *The Wall Street Journal.* It would be a useful reference to accounting professors, practitioners, and students who are developing their vocabularies or seeking an industry term or usage.

H.S.H.

K. FRED SKOUSEN, *An Introduction to the SEC,* Third Edition (Cincinnati: South-Western Publishing Co., 1983, pp. vi, 160, $8.70 paper).

This text updates the two previous editions (reviewed April 1981, pp. 443-444, and April 1977, p. 559). Like its predecessors, this edition presents a brief overview of the origins, development, authority, organizational structure, procedures, activities, and impact of the Securities and Exchange Commission. Useful illustrations and exhibits are included in four of the five chapters. Discussion questions are included at the end of each chapter and discussion points for each chapter are included in an appendix at the end of the text. The appendix also includes six pages of references, most of which were included in the first edition, and none have been added or deleted for the third edition.

This small volume should, like its predecessors, be a useful supplement in accounting and auditing classes in undergraduate, graduate, and continuing education programs. It could be made even more useful if the lead-time for its publication could be reduced or if the time between editions were reduced to two years in those periods when significant changes are occurring. For example, one change that occurred early in 1982 made numerous sections of the 1983 edition obsolete before it was published; this was the conversion of the Accounting Series Releases (ASR) into two publications: Financial Reporting Releases (FRR) and Accounting and Auditing Enforcement Releases (AAER). FRR No. 1 was a codification of the reporting ASRs still in effect and AAER No. 1 was a compilation of the enforcement AAERs; both were indexed to the old ASRs and were issued April 15, 1982.

H.S.H.

David Solomons, *Divisional Performance: Measurement and Control* (New York: Markus Wiener Publishing, Inc., 1983, pp. xii, 307, $14.00 paper).

This is a reprint of a study that was sponsored by the Financial Executives Research Foundation and published in 1965 (reviewed January 1968, pp. 212–213) and that received the AICPA Award for notable contributions to the literature in 1969.

In the foreword to the reprint, the author states that although some terminology has changed, and agency theory has been advanced as a means of rigorously and abstractly spelling out the relationships in a divisionalized firm, the study has not been superseded. He also reiterates the serious, continuing need for research to find ways "to develop incentive systems that are more closely tied to long-term divisional performance, and that will better reward managers who build for the future" (p. vi).

H.S.H.

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David R. Adams, Gerald E. Wagner, and Terrence J. Boyer, *Computer Information Systems: An Introduction* (Cincinnati: South-Western Publishing Co., 1983, pp. xxvi, 514, $25.50).

W. Steve Albrecht, Keith R. Howe, and Marshall B. Romney, *Deterring Fraud: The Internal Auditor's Perspective* (Altamonte Springs, FL: The Institute of Internal Auditors Research Foundation, 1984, pp. xvi, 169, $33.00).

Frank M. Alston, et al., *Contracting with the Federal Government* (New York: John Wiley & Sons, 1984, pp. ix, 525, $55.00).

Robert N. Anthony, *A Reference Guide to Essentials of Accounting* (Reading, MA: Addison-Wesley Publishing Co., 1985, pp. ix, 149, $12.95 paper).

Bhabatosh Banerjee, *Financial Policy and Management Accounting* (Calcutta, The World Press, Pvt., Ltd., 1984, pp. x, 750, $6.00, £3.50 RS. 42.00 paper).

Andrew Barr, *Written Contributions of Selected Accounting Practitioners,* Volume 3 (University of Illinois at Urbana-Champaign, Department of Accountancy, 1980, pp. ix, 773, $15.00 paper).

Alexander Berger, Editor, *International Tax Summaries 1984: A Guide for Planning and Decisions* (New York: John Wiley & Sons, 1984, pp. ix, 975, $65.00).

Leopold A. Bernstein, *Analysis of Financial Statements,* Revised Edition (Homewood: Dow Jones-Irwin, 1984, pp. xi, 381, $25.00).

Kathleen Ranney Bindon, *Inventories and Foreign Currency Translation Requirements* (Ann Arbor, MI: UMI Research Press, 1983, pp. ix, 145, $29.00 cloth, $23.00 paper).

J. Efrim Boritz, *Planning for the Internal Audit Function* (Altamonte Springs, FL: The Institute of Internal Auditors Research Foundation, 1983, pp. xvi, 342, $37.50).

A. Brentnall, "Audit File Review," *Accountant's Digest No. 159* (London: The Institute of Chartered Accountants in England and Wales, 1984, pp. 62, £5.00 paper).

Earl Brooks and George S. Odiorne, *Managing by Negotiations* (New York: Van Nostrand Reinhold Co., 1984, pp. x, 224, $26.95).

David H. Butler, *An Income Tax Planning Model for Small Businesses* (Ann Arbor, MI: UMI Research Press, 1981, pp. viii, 324, $44.95 cloth, $19.95 paper).

Bryan Carsberg and Michael Page, Joint Editors, *Current Cost Accounting: The Benefits and the Costs,* Four Volumes (London: Prentice/Hall International in association with The Institute of Chartered Accountants in England and Wales, 1984, pp. xviii, 484, The Four Volume Set £28.00, $42.00 paper).

Edouard Chambost, Translated by Peter Walton and Margaret Thompson, *Bank Accounts: A World Guide to Confidentiality* (Chichester and New York: John Wiley & Sons, 1983, pp. xii, 322, $31.95).

A. Charnes and W. W. Cooper, Editors, *Creative and Innovative Management: Essays in Honor* *of George Kozmetsky* (Cambridge, MA: Ballinger Publishing Company, 1984, pp. xxxi, 268, $25.00).

J. Owen Cherrington, E. Dee Hubbard, and David H. Luthy, *Cost and Managerial Accounting* (Dubuque, IA: Wm. C. Brown, 1985, pp. xxi, 884, $33.50).

James F. Clark and William O. Drum, *Basic Programming: A Structured Approach* (Cincinnati: South-Western Publishing Co., 1983, pp. vi, 538, $19.00 paper).

David Clurman, F. Scott Jackson, and Edna L. Hebard, *Condominiums and Cooperatives*, Second Edition (New York: John Wiley & Sons, 1984, pp. xii, 350, $29.95).

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John E. Cooke and Brian R. Dobing, *Management Control of Computer-Related Errors* (Hamilton: The Society of Management Accountants of Canada, 1984, pp. x, 127, Can. $10.00 paper).

Philip Creighton, *A Sum of Yesterdays: Being a History of the First One Hundred Years of the Institute of Chartered Accountants of Ontario* (Toronto: The Institute of Chartered Accountants of Ontario, 1984, pp. xxiv, 360, Can. $50.00).

Colin G. Davis and Michael Koppel, "A Guide to the Finance Act of 1984," *Accountants Digest No. 160* (London: The Institute of Chartered Accountants in England and Wales, 1984, pp. vii, 110, £7.50 paper).

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G. D. Donleary and M. Metcalfe, *How to Manage Money* (Brookfield, VT and London: Gower Publishing Co. and Business Books, 1984, pp. 222, $19.95).

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Financial Accounting Standards Board, *Accounting Standards: Original Pronouncements, July 1973–June 1, 1984*, 1984/85 Edition (New York: McGraw-Hill Book Co., 1984, pp. iii, 1,454, $20.95 paper).

Financial Statements for Pension Plan Participants, A Research Study (Toronto: Canadian Institute of Chartered Accountants, 1984, pp. xvii, 88, Can. $16.00 paper).

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Harry M. Gilbert and Arthur I. Larky, *Practical Pascal* (Cincinnati: South-Western Publishing Co., 1984, pp. x, 470, $17.50 paper).

Gary A. Giroux and Peter S. Rose, *Financial Forecasting in Banking: Methods and Applications* (Ann Arbor, MI: UMI Research Press, 1981, pp. viii, 188, $39.95 cloth, $14.95 paper).

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The American Accounting Association is pleased to announce the selection of its 1985 Distinguished International Visiting Lecturers in Accounting. Yuji Ijiri, Robert M. Trueblood Professor of Accounting and Economics at Carnegie-Mellon University's Graduate School of Industrial Administration, was selected as the professor from the United States or Canada to visit educational institutions in Australia, New Zealand, and Japan in May and June of 1985. Hein Schreuder, Professor of Business Economics at the University of Limburg in Maastricht, The Netherlands, was selected as the Distinguished Lecturer to visit schools in the United States and Canada in the Fall of 1985.

The American Accounting Association is appreciative of the financial support this program receives from Exxon Corporation. The Exxon Controller's Grant in the amount of $5,000 is used by the Association to provide financial support connected with this program.

Yuji Ijiri is the Robert M. Trueblood Professor of Accounting and Economics at Carnegie-Mellon University's Graduate School of Industrial Administration. He received his LL.B degree from Ritsumeikan University (Japan), an M.S. degree from the University of Minnesota, and a Ph.D. from Carnegie-Mellon University. Prior to joining the Carnegie-Mellon University faculty in 1967, he taught at Stanford University and was with the Tokyo office of Price Waterhouse & Co. Yuji Ijiri joined the American Accounting Association in 1964 and has been active in Association affairs, serving on many AAA committees. He was elected Vice-President in 1974–75 and served as President of the Association in 1982–83. Yuji Ijiri has been a consultant to Gulf Oil Corporation, Ford Foundation, American Institute of CPAs, Financial Accounting Standards Board, and National Science Foundation. He is a four-time recipient of the AICPA Accounting Literature Award and has published numerous articles and books, including *Theory of Accounting Measurement,* which was published by the AAA as Study #10 in its Accounting Research Series, *Triple-Entry Bookkeeping and Income Momentum,* which was published as Studies in Accounting Research #18, and Volume No. 6 in the Association's Accounting Education Series *Accounting Structured in APL.*

Yuji Ijiri will lecture at the following universities: The University of New South Wales, University of Queensland, Victoria University of Wellington, The University of Auckland, The University of Sydney, University of Tasmania, The University of Melbourne, Monash University, Tohoku University.

Hein Schreuder will visit universities in the United States and Canada under the American Accounting Association's Distinguished International Visiting Lecturer Program in the Fall of 1985. He is presently Professor of Economics at the University of Limburg in Maastricht, The Netherlands. Hein Schreuder received his MBA at the Erasmus University of Rotterdam and the Ph.D. in 1981 at the Free University of Amsterdam. He has taught at the Erasmus University of Rotterdam, the Netherlands Economic Institute in Rotterdam, the Free University of Amsterdam, and the European Institute for Advanced Studies in Management, Brussels, prior to going to the University of Limburg in Maastricht. He also served as Visiting Scholar at the University of Washington in 1982–83. Hein Schreuder has authored or co-authored four books and has published many articles in English as well as Dutch, including several articles in *The Accounting Review.* He is presently serving as co-chairman of the Doctoral Colloquium of the European Accounting Association and co-chairman of a workshop on "Accounting and Culture" of the European Institute for Advanced Studies in Management. Hein Schreuder has also served as a member of the Editorial Board of *The Accounting Review* and attended the AAA/DH&S 1984 Doctoral Consortium as an observer prior to accepting his co-chairmanship of the 1985 European Accounting Association Doctoral Colloquium.

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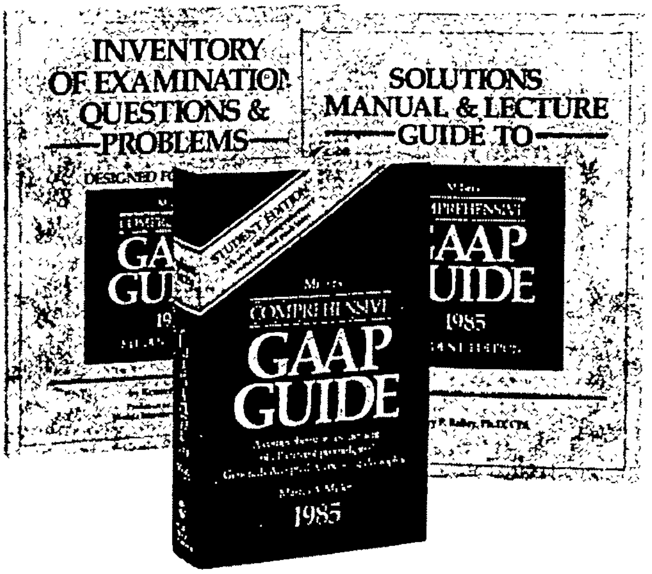
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THE ACCOUNTING REVIEW
Vol. LX, No. 4
October 1985

An Investigation of Auditor Judgment in Analytical Review

Stanley F. Biggs and John J. Wild

ABSTRACT: Experiments involving variations on two analytical review task situations were used to assess practicing auditors' judgments. The first experiment required auditors to generate expected values and noninvestigation intervals given variations in the amount of audited information available and the presence or absence of unaudited information. Consistent with prior research, the auditors' judgments were biased in the direction of the unaudited information. However, this bias was moderated when additional audited information was available. The second experiment required auditors to extrapolate intuitively an expected value for an account, given six different deterministic time-series patterns. The auditors' extrapolations were more accurate for those time-series patterns that are more likely to be encountered in practice. That is, extrapolations were slightly more accurate for increasing trends than decreasing trends, and were more accurate for linear and logarithmic patterns than exponential patterns. Implications for research and practice are discussed.

I. Introduction

Analytical review has received significant attention in the auditing literature. Most analytical review research has been directed at developing and testing statistical procedures used in generating expected values for the account under review.[1] While such research is needed, it generally ignores the judgmental processes inherent in analytical review [Felix and Kinney, 1982]. For example, Biggs and Wild [1984] found that over 90 percent of the auditors surveyed used judgmentally-based procedures in analytical review. Since there is considerable evidence that biases affect human judgments, including auditor judgments, it is important to obtain knowledge of how auditors make analytical review judgments.[2]

The purpose of this paper is to report the results of two experiments involving auditor judgments in various aspects of analytical review. The first experiment

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[1] See, for example, Stringer [1975], Albrecht and McKeown [1977], Kaplan [1979], Kinney [1978, 1979], Akresh and Wallace [1982], Lev [1980] and Neter [1982]. On the other hand, only three studies have examined auditor judgments in the analytical review: Kinney and Uecker [1982], Holder [1983] and Blocher, Esposito and Willingham [1983].

[2] For evidence of judgmental biases, see Gibbins [1977], Uecker and Kinney [1977], Joyce and Biddle [1981], Kinney and Uecker [1982], and Hogarth and Makridakis [1981].

The authors would like to acknowledge the helpful comments from Walter Bagen, Robert Compton, Ed Joyce, Robert Libby, Ted Mock, Larry Rittenberg, anonymous reviewers, and the participants at the Price Waterhouse Symposium and workshops at the University of Florida and University of Southern California.

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Manuscript received March 1983.
Revisions received October 1983, April 1984 and February 1985.
Accepted March 1985.

was adapted from Kinney and Uecker [1982] and required auditors to generate an expected value and set noninvestigation boundaries. Auditor judgments were examined across varying task conditions including the presence or absence of unaudited data and amount of the audited information provided. The second experiment required auditors to extrapolate intuitively an expected value for an account. The accuracy of auditors' judgments was examined for six different deterministic time-series patterns.

In the next section, some background about analytical review is presented to provide an integrative framework for the two experiments. In the two sections that follow, each experiment is described in terms of prior empirical evidence, hypotheses, and results. The paper concludes with suggestions for future research.

II. BACKGROUND

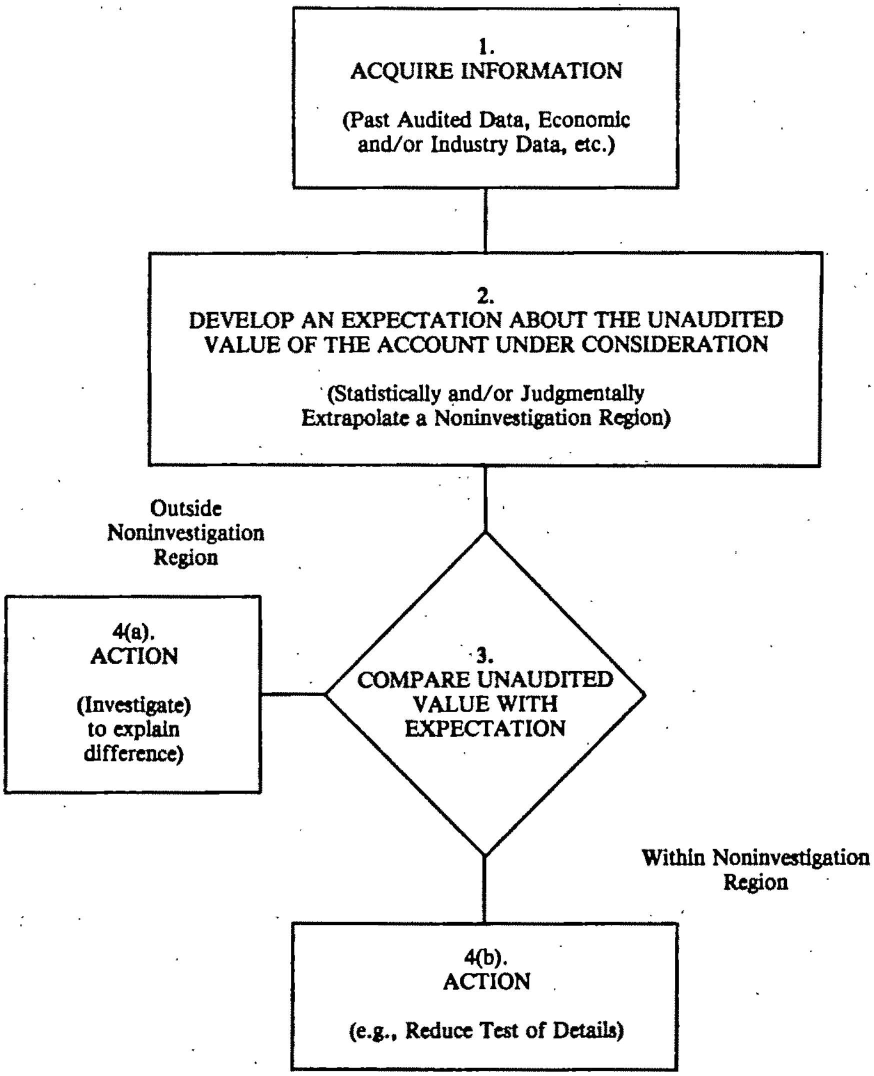
In a recent review of auditing research, Felix and Kinney [1982] suggest that there are nine major phases of the auditor's opinion formulation process. They consider analytical review to be part of the planning and substantive testing phases. Elsewhere, analytical review has also been considered part of a final review [AICPA, 1978]. However, there is little knowledge of how analytical review is applied or affects these phases of the audit [Lev, 1980]. One model of an analytical review process has been proposed in the literature. Mock, Biggs and Watkins [1982] suggest that analytical review is composed of five interrelated steps: (1) preliminary information search and goal setting, (2) information acquisition, (3) information evaluation, (4) combining evaluated information to take action or make a choice, and (5) feedback. Within the boundaries of these two general frameworks, a more specific process is proposed to motivate the empirical research reported here.

Figure 1 describes an analytical review process that incorporates the judgments investigated in this research. The figure is based on Kinney's [1979, p. 149] suggestion that in conducting an analytical review, the auditor forms an expectation about what the unaudited book value should be by determining a range of acceptable values (i.e., forms a noninvestigation region). The unaudited value is then compared with the noninvestigation region, and depending on the outcome of this comparison, various actions would be taken. This research was concerned with the judgments involved in forming the expectation shown in the second step in Figure 1.

Several important points related to this research can be seen in Figure 1. As indicated in the first step of Figure 1, the auditor may acquire a variety of information. However, Kinney and Uecker [1982, p. 67, emphasis ours] point out, ". . . the ONLY inappropriate information is the book value(s), which comprise the basis for comparison." Explicit support for this statement is not present in the professional literature (auditing standards are seldom so specific), and the academic literature (other than Kinney and Uecker) has not specifically addressed the issue. Nevertheless, there is considerable implicit support in the literature, from which two fundamental supporting lines of reasoning can be abstracted. First, the use of unaudited values to form an expectation about the true book value is a violation of the requirement that auditors make *independent* evaluations of clients' financial statements [AICPA, 1980]. The professional literature regards unaudited book values as "management assertions" [AICPA, 1980] and requires that auditors view management assertions with professional skepticism based on the ever-

FIGURE 1

ANALYTICAL REVIEW PROCESS DURING THE SUBSTANTIVE PHASE OF AN AUDIT


1.
ACQUIRE INFORMATION
(Past Audited Data, Economic and/or Industry Data, etc.)
2.
DEVELOP AN EXPECTATION ABOUT THE UNAUDITED VALUE OF THE ACCOUNT UNDER CONSIDERATION
(Statistically and/or Judgmentally Extrapolate a Noninvestigation Region)
Outside Noninvestigation Region
4(a).
ACTION
(Investigate) to explain difference)
3.
COMPARE UNAUDITED VALUE WITH EXPECTATION
Within Noninvestigation Region
4(b).
ACTION
(e.g., Reduce Test of Details)

present possibility that they contain errors and/or irregularities [AICPA, 1977]. Indeed, it is the auditor's primary responsibility to obtain *independent evidence* necessary to test and evaluate the accuracy of these management assertions. The auditor obtains one source of evidence via analytical review by developing an independent estimate of the true book value and comparing it to the unaudited value in order to identify unusual fluctuations [AICPA, 1978]. Clearly, using a management assertion (i.e., the unaudited value) to form an expectation about the true book value violates the notion of independent evidence.

FIGURE 2

TASK FOR EXPERIMENT ONE

You are the auditor for a small manufacturing firm. You are conducting an analytical review of the Company's gross profit percentage. The values of the component accounts and the ratios based on the audited values for the last five audit years and the current period's unaudited values are reproduced below. Note, the (000's) have been omitted.

	(I)			*(II)*		*(III)*	*(IV)*
	19X1	*19X2*	*19X3*	*19X4*	*19X5*	*Unaudited 19X6*	*Unaudited 19X6*
Sales	$19,986	$22,645	$20,189	$19,778	$23,941	$24,265	$24,265
Cost of Sales	$16,428	$18,275	$16,454	$15,893	$19,749	$20,868	$18,660
Gross Profit	$ 3,558	$ 4,370	$ 3,735	$ 3,885	$ 4,192	$ 3,397	$ 5,605
Gross Profit Percentage	17.8%	19.3%	18.5%	19.6%	17.5%	14.0%	23.1%

You have no reason to expect major changes from recent historical relationships.

REQUIRED: 1. Indicate your best estimate of the expected audited value for this year's (19X6) gross profit percentage. Also indicate the upper and lower bounds of possible values *beyond* which you feel *95 percent confident* that an investigation should be conducted to "explain" the apparent change in the gross profit percentage for 19X6.

Gross Profit Percentage

Expected Audited Value ________%

95 Percent Confidence Bounds Requiring an Investigation:

Upper Bound of Range of Values ________%

Lower Bound of Range of Values ________%

Second, the use of unaudited book values to form an expectation about the true book value will increase the auditor's risk of not investigating accounts that are materially in error (beta risk). To understand why this is so, consider the situation where the auditor uses some analytical review technique such as regression analysis to predict the true book value. If the unaudited value is used as one of the independent variables in the model,[3] then the noninvestigation region around the predicted true book value will be shifted in the direction of the unaudited value (assuming positive weight is given to the unaudited value in the model). If the unaudited value contains material errors or irregularities, such a noninvestigation region will increase the probability of not investigating an account that should be investigated and beta risk will be increased.[4] Not finding a material error or irregularity can be very costly for the auditor (e.g., expensive law suits, etc.). In fact, it is often suggested that auditors structure their tests so as to minimize this type of risk [Bailey, 1981; Elliott and Rogers, 1972].[5]

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[3] This statement should not be construed as a recommendation that unaudited values be used as independent variables in regression models designed to predict the *same* unaudited value. Rather, the statement illustrates the negative effects if unaudited values were used as independent variables in regression models. In fact, Stringer [1975, p. 6] referred to such uses of information as a "logical absurdity."

Kinney and Uecker [1982] investigated the issue of whether auditors would use the unaudited values to form expectations, and the purpose of the first experiment was to extend their research.

Another important point exemplified in Figure 1 is that auditors can develop expected values for unaudited accounts in various ways, including the use of formal statistical models or intuitive judgment. Investigating how auditors judgmentally form these expectations is important for two reasons: (1) because time, cost, or data constraints can prevent the use of statistical models, there may be situations where auditors prefer to develop expected values judgmentally [Kinney, 1979; Kinney and Uecker, 1982; Mock, Biggs and Watkins, 1982; Biggs and Wild, 1984], and (2) currently there is no evidence on how accurate auditors are in generating expected values. Since judgmentally forming an expectation could involve intuitive extrapolations of past audited information, the purpose of the second experiment was to investigate auditor performance in making this type of judgment.

III. EXPERIMENT ONE

Empirical Background and Research Issues

Since the purpose of this experiment was to extend the research conducted by Kinney and Uecker [1982], their study is briefly reviewed.[6] Kinney and Uecker had 154 auditors perform an analytical review of the gross profit for a small manufacturing firm. The auditors were provided with audited information about the components of the firm's gross profit and the gross profit percentage for two prior years. This information is equivalent to block II in Figure 2.[7] The auditors' task was to specify a noninvestigation region for the gross profit percentage.

Kinney and Uecker were concerned that the noninvestigation region established by auditors would be inappropriately affected by the opportunity to observe the client's unaudited book values. In particular, they hypothesized that auditors' responses would be biased in the direction of the client's unaudited book values.[8] To test this hypothesis, they provided one group of auditors with a low unaudited book value and another group with a high unaudited book value (respectively labeled III and IV in Figure 2). Kinney and Uecker found that the noninvestigation regions set by the two groups were significantly different and biased in the direction of the unaudited book values. Thus, their hypothesis was supported.

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[4] It is recognized that if the unaudited book value does *not* contain a material error, circumstances can exist where the use of the unaudited book value to form a noninvestigation region could reduce the risk of investigating an account that should not be investigated (alpha risk). However, beta risk would not be reduced since, by definition, beta risk cannot exist if the account is not materially misstated. Thus, the only positive effect of including the unaudited book value in the prediction model would be to reduce alpha risk in some, but not all, circumstances. The auditing literature, however, overwhelmingly supports the conclusion that protecting against beta risk is more important than protecting against alpha risk. Thus, in this paper it is assumed that protecting against beta risk is the major concern and any normative statements reflect this concern.

[5] If one maintains a "classical" hypothesis testing role for auditors, it is obvious that the auditor's predicted true value for an account should not be conditioned by management's assertion for that account.

[6] Two other papers involving auditor judgment in analytical review have been published. Holder [1983] reports frequencies of ratios calculated by auditors who had devised and executed an analytical review program after studying a case involving a small wholesaler. The resulting programs included a wide variety of financial ratios. Although he also had the auditors prepare a memorandum identifying audit risk areas, no results were reported. Blocher, Esposito and Willingham [1983] investigated the effects of certain situational variables on auditors' judgments about planning and using analytical review procedures. Although considerable variability among planning judgments was found, none of the situational variables could explain the variability. Judgments related to using analytical review procedures were less variable, but a limited response mode may have influenced the achieved consensus.

[7] Figure 2 shows our experimental task. However, Kinney and Uecker's [1982] analytical review task is subsumed within our experimental task.

Kinney and Uecker also compared the two groups on the basis of the frequency of investigations implied by the noninvestigation intervals established by each auditor. They found that 81 percent of the auditors receiving the high book value had implied investigations compared to only 61 percent of the auditors receiving the low book value. This result suggested that the former group was more suspicious of the unaudited value since the high unaudited value was inconsistent with the downward trend in the prior years' data (see Figure 2). Thus, Kinney and Uecker concluded that the auditors who received the high book value were less influenced by the unaudited data than the auditors who received the low book value.

Since unaudited book values are readily available during audits, the findings of Kinney and Uecker have important implications for the practice of analytical review. As pointed out earlier, if unaudited values influence the auditor's noninvestigation intervals, the risk of not detecting material errors will be increased. Thus, it is important to conduct further research on the issue. The following four issues provided the motivation for Experiment One.

First, given the serious implications of Kinney and Uecker's findings, an important research objective was determining the extent to which their results could be obtained with different subjects and a slightly modified task environment. Providing evidence of the robustness of Kinney and Uecker's findings is important for the development of scientific knowledge about the issue [Abdel-khalik and Ajinkya, 1979] and is important for practitioners who may want to change their procedures based upon such research results [Einhorn and Hogarth, 1982].

Second, directly comparing the responses of the high book value and low book value groups, as was done by Kinney and Uecker, provided evidence about the *existence* of any influence of unaudited values on the auditors' responses. However, their experimental design did not provide unambiguous information about the *extent* of influence for the two groups. In the Kinney and Uecker task, the low unaudited value was consistent with the downward trend in audited data while the high unaudited value was a reversal of the trend. This factor injected a potentially confounding influence in their results. That is, in attempting to understand the responses of the low book value group, it is difficult to separate an explanation based upon the influence of the unaudited value from an alternative explanation that they set their noninvestigation boundaries consistent with the downward trend. To provide insight about the *extent* of this influence, a control group was added. The control group consisted of auditors who did not receive an unaudited value, and thus their responses could not have been influenced by the unaudited value. Comparing the responses of high and low book value groups with the control group provided insight about the extent of influence of the unaudited value.[9]

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[8] Kinney and Uecker [1982] referred to this as an "anchoring bias" based on Tversky and Kahneman [1974]. However, the specific link between anchoring bias and Kinney and Uecker's study (and our Experiment One) is somewhat tenuous. While it is possible that anchoring bias could account for their results, other explanations are possible. For example, hindsight bias (i.e., the effect of outcome knowledge (unaudited data) on predictions [Fischhoff, 1975]) could also account for their results. Thus, we avoid the use of the term "anchoring," and simply refer to the phenomenon as the "effect of unaudited data."

Third, since a task containing only two years of data may be restrictive in comparison to the amount of data that would ordinarily be available during an actual audit, some auditors were provided with five years of data. This provided a basis for determining if Kinney and Uecker's results would hold in a less restrictive information environment.

Fourth, Kinney and Uecker did not require their subjects to specify noninvestigation intervals of a particular size (e.g., some subjects may have set 95 percent intervals while others may have set 85 percent intervals). While this may be representative of actual practice, it did allow a potential source of variation that may have affected their interpretation of the auditors' responses. Thus, a constant noninvestigation interval (95 percent) was established for all subjects.[10]

Subjects

The subjects for Experiment One were 121 practicing auditors representing four Big-Eight accounting firms from a large metropolitan area.[11] Audit experience of the participants ranged from less than a year to over 24 years, and their positions within the firms ranged from newly hired staff auditor to partner.[12] A partner at each of the four firms volunteered to distribute the experimental materials to subjects and return the completed materials to the researchers. The experimental materials were self-explanatory, and emphasized the importance of working independently.

Experimental Task and Procedures

The experimental task (see Figure 2) was adapted from an analytical review exercise used by Kinney and Uecker [1982]. All auditors performed the analytical review task, which included a review of the company's gross profit percentage and its components. However, the number of prior years of audited information and the availability of the client's unaudited book values were varied across auditors. These variations were defined in reference to the blocked sets of data (i.e., I, II, III, and IV) shown in Figure 2.

Auditors were randomly distributed among groups receiving variations on the information set. Three groups received "short" information sets that included two prior periods of audited values. Auditor groups receiving the low and high unaudited book values for the short information sets were defined as $SL=\text{II}+\text{III}$ and $SH=\text{II}+\text{IV}$, respectively. A control group, not receiving the unaudited data, was established for the short information set, defined as SN = II. Groups receiving the "long" information sets (five years of audited information) were provided with the same low and high unaudited values, respectively defined as $LL=\text{I}+\text{II}+\text{III}$ and $LH=\text{I}+\text{II}+\text{IV}$. A control group (i.e., auditors not receiving the unaudited client data) was also established for the long information sets defined as $LN = I + II$. The background information, directions, and required responses were invariant across all groups.[13]

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[9] It is recognized that unaudited values are available during an audit. Thus, the control groups add to experimental precision rather than external validity.

[10] Other modifications included obtaining an estimate for the audited value itself (i.e., "Expected Audited Value").

[11] Responses were received from 127 auditors. However, six auditors failed to provide one or both of the upper and lower bounds of the noninvestigation interval, and their responses were eliminated.

[12] The results for Experiments One and Two were examined for experience effects. Experience did not explain any of the results obtained.

Hypotheses Related to the Short Information Sets

The first hypothesis was similar to Kinney and Uecker's. In fact, the *SL* and *SH* auditor groups received the same information sets as the two auditor groups in their analytical review case. Consistent with their hypothesis, it was expected that the auditors' responses would be influenced by the client's unaudited book values. Specifically, the following was hypothesized:

H1.1: Estimates for the expected value (EV) and upper (UB) and lower (LB) bounds given by the *SL* and *SH* auditors will be biased[14] in the direction of the unaudited values.

The second hypothesis was concerned with the *extent* of influence of the unaudited values on the responses of the high and low book value groups. As discussed earlier, Kinney and Uecker suggested that the reversal of the trend represented by the high unaudited book value may have raised the suspicions of the auditors, thereby tempering the bias in their responses. Indeed, Joyce and Biddle [1981, p. 128] found similar results in a different task. However, the downward trend in the audited data makes it difficult to determine unambiguously the *extent* of influence by making direct comparisons of *SH* and *SL* auditors. For example, one might have expected auditors who did *not* receive the client's unaudited book values to extrapolate the downward trend and establish noninvestigation intervals similar to those auditors who received the low unaudited book value. This alternative explanation suggests that auditors who received the high book value rather than auditors who received the low book value were influenced more by the unaudited value. To investigate this alternative explanation, the *SH* and *SL* responses were compared with the responses of a control group (defined as *SN* auditors here). In addition to clarifying Kinney and Uecker's results, understanding the extent of influence of low and high unaudited values provides knowledge of particular conditions (in this case consistent trends versus inconsistent trends) that correlate with greater or lesser judgmental bias. Gaining insight about the conditions associated with judgmental bias has been called for as one of the important directions for research in decision making [Einhorn and Hogarth, 1982; Payne, 1982]. Thus the following hypothesis was formulated:

H1.2: Differences between estimates for *EV*, *UB* and *LB* given by *SH* and *SN* auditors will be greater than the differences between those same estimates given by *SL* and *SN* auditors.

The third hypothesis was concerned with the effect of observing the client's unaudited values on the investigations implied by the auditors' noninvestigation intervals. As discussed earlier, Kinney and Uecker found that auditors who received the high unaudited value had significantly more implied investigations than those receiving the low unaudited value. This result suggested that the effect of the unaudited value was greater for the low book value group than the high book value group. However, these results are difficult to interpret in the absence of a control group. Alternatively, it was expected that comparing *SH* and *SL* auditors with *SN* auditors would provide a more precise assessment of the *extent* to which *SH* and *SL* auditors' judgments were affected by the unaudited values. Consequently, the following was hypothesized:

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[13] Alternatively, one may describe the experimental design as a 2×3 between-subject design, where the "2" represents the variation in the short vs. long information sets, and the "3" represents auditors receiving the high (low) unaudited value and the control group.

[14] The term bias reflects the conclusion established earlier that it is *inappropriate* for an auditor's noninvestigation interval to be influenced by the client's unaudited book value.

H1.3: Differences in the frequency of implied investigations between *SH* and *SN* auditors will be significantly greater than the differences in the frequency of implied investigations between *SL* and *SN* auditors.[15]

Hypotheses Related to the Long Information Sets

Since more than two years of audited information is normally available for use by an auditor, it is not clear that similar results would be obtained in analytical review tasks where more information is available. Thus, the effect of additional information on auditors' judgments was investigated by expanding the information set from two years to five years.[16] Underlying this expansion of data were two issues: (1) Would the additional information affect the auditors' estimates? and (2) Would the additional information moderate any influence of unaudited values on auditors' estimates? To investigate the first issue, two hypotheses (H1.4 and H1.5) were developed. If auditors' responses across the long and short information sets were different, then it could be concluded that the additional information was used. Thus the following hypothesis was formulated:

H1.4: The estimates for *EV, UB,* and *LB* given by auditors receiving the long information set will be significantly different than estimates given by auditors receiving the short information set (i.e., *LN* vs. *SN, LL* vs. *SL,* and *LH* vs. *SH*).

Another effect of additional data on the auditors' judgments concerned the width of the noninvestigation interval. Narrower noninvestigation intervals indicate greater auditor confidence in the procedure. That is, as the auditor obtains a better understanding of the process that generates account values, the auditor will be more confident in predicting the unaudited value and the range of acceptable values will be narrower. In the extreme case where the world is deterministic and the auditor knows everything about the process, the noninvestigation interval will be very small since the auditor can accurately predict the unaudited value.[17] Hogarth [1981] indicates that increases in information result in greater confidence in decisions. Thus, it was expected that noninvestigation intervals for auditors receiving long information sets would be narrower than those established by auditors receiving short information sets.[18] This led to the following hypothesis:

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[15] Statement on Auditing Standards section 318.03-.04 states that a "basic premise underlying the application of analytical review procedures is that relationships among data may reasonably be expected by the auditor to exist and continue in the absence of known conditions to the contrary" and that "when analytical review procedures identify fluctuations that are not expected, or the absence of fluctuations when they are expected, or other items that appear to be unusual, the auditor should investigate them." Consequently, since the SN auditors could not be influenced by the unaudited data, it was expected that they would conduct the analytical review consistent with that outlined in the standard above (i.e., continuance of the trend). Alternatively, as suggested by one reviewer, auditors may conduct analytical reviews in a manner different from that prescribed in the auditing standards. If the latter is true, H1.2 and H1.3 may provide findings on an "artifact" of the experimental design as opposed to actual audit practice. Resolution of this issue is left for future research.

[16] The mean of the gross profit percentage series remained essentially the same (18.55 to 18.54) across the short and long data sets.

[17] In terms of the analytical review process in Figure 1, this issue involves the effect of variation in the information set (Step 1) on the formation of a noninvestigation interval (Step 2).

H1.5: Noninvestigation intervals established by auditors receiving long information sets will be narrower than noninvestigation intervals established by auditors receiving short information sets (*SN* vs. *LN*, *SL* vs. *LL*, and *SH* vs. *LH*).

The second issue related to expanding the information set was concerned with determining if the additional information would moderate any influence of unaudited values on the auditors' judgments. It is possible that those auditors who received only two years of audited data were led to use the unaudited data because of the paucity of audited information on which to base their judgments. Although the use of unaudited data in this manner is inappropriate, a task that provides more information may reduce or eliminate such use of unaudited data. If the auditors who received unaudited values (*LL* and *LH*) provided estimates equal to the control group (*LN*), then evidence of an elimination of the effect of unaudited values would exist. Consequently, the following hypothesis was formulated:

H1.6: Estimates for *EV*, *UB*, and *LB* values given by *LL* and *LH* auditors will be equal to the estimates given by *LN* auditors.

Earlier it was noted that the ultimate decision in an analytical review is the investigation implied by the placement and width of the noninvestigation interval. Thus, consistent with the rationale for H1.6, it was expected that there would be no differences in the frequency of implied investigations among the three auditor groups, and the following hypothesis was developed:

H1.7: The frequency of implied investigations among *LN*, *LL*, and *LH* auditors will be equal.

Results: Short Information[19]

The first hypothesis, consistent with Kinney and Uecker [1982], predicted that *SL* and *SH* estimates would be biased in the direction of the unaudited values. Estimates given by the *SL* and *SH* auditors were significantly different, and were biased in the direction of the client's unaudited book values (supporting hypothesis H1.1). Differences in medians across the two groups on the *EV*, *UB*, and *LB* values were, respectively, 2.15, 2.0, and .87 (Table 1), with significance levels of .000, .001, and .011 (Table 2). The direction of the bias is apparent by comparing the *EV*, *UB*, and *LB* median values for *SL* auditors (i.e., respectively 16.35, 18.0, and 15.63) with the responses of *SH* auditors (i.e., respectively 18.5, 20.0, and 16.5). Thus, these findings were consistent with Kinney and Uecker's, confirming the potential danger of auditors observing the client's unaudited book values

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[18] This is even more apparent when one considers that the mean of the gross profit percentage series remained essentially the same under the long information set, and that the variance decreased (i.e., 1.48 to .91) in moving from the short to the long information set.

[19] In the previous sections, hypotheses were presented in their substantive forms. In the results sections, statistical hypotheses for each estimate given by the auditors (i.e., EV, UB, LB) were tested in their null forms. The distribution of the auditors' responses was tested for normality and of 18 distributions only four could be rejected at the .01 level. Nevertheless, to be conservative we relied on non-parametric (Mann-Whitney) tests for all hypotheses. For comparison purposes, the results of parametric *t*-tests are also reported. Since the alternative hypotheses for H1.1, H1.2, H1.5, and H1.6 specified a particular directional difference (i.e., less than or greater than), one-tailed tests were used. For H1.3, H1.4, and H1.7 the alternative hypotheses reflected differences without specifying direction, and thus two-tailed tests were used. Finally, for ease of discussion, when a null hypothesis was rejected, we indicate that the alternative hypothesis was supported.

TABLE 1

DESCRIPTIVE STATISTICS ON AUDITORS' ESTIMATES

GROUP		*EV*	*UB*	*LB*
	Median	17.25	19.55	16.00
SN	Mean	16.93	18.85	15.59
($n=26$)	Std. Dev.	1.34	1.53	1.25
	Median	16.35	18.00	15.63
SL	Mean	16.35	18.00	15.30
($n=20$)	Std. Dev.	1.40	1.75	1.66
	Median	18.50	20.00	16.50
SH	Mean	18.42	20.46	16.54
($n=19$)	Std. Dev.	1.80	2.67	1.34
	Median	18.50	19.60	17.00
LN	Mean	18.53	19.86	17.05
($n=21$)	Std. Dev.	0.52	1.28	0.59
	Median	18.23	20.00	16.10
LL	Mean	17.54	20.26	16.07
($n=14$)	Std. Dev.	1.89	1.11	1.45
	Median	18.50	20.00	17.50
LH	Mean	19.09	20.40	17.34
($n=21$)	Std. Dev.	1.05	1.01	1.03

while performing analytical review.[20]

It was predicted in H1.2 that *SH* auditors would be more influenced by the unaudited value than *SL* auditors. Specifically, H1.2 predicted that the difference between *SH* and *SN* judgments would be greater than the difference between *SL* and *SN* judgments. While a direct test of this hypothesis was not possible,[21] comparing differences among medians and means of the *EV*, *UB*, and *LB* values across *SL-SN* and *SH-SN* comparisons (summarized in Table 3) provided indirect evidence in support of H1.2. Five out of six comparisons show greater differences in *SH-SN* comparisons than in *SL-SN* comparisons, with only the *UB* median showing a larger difference on the *SL-SN* comparison. Further, *all six* significance levels were greater for the *SH-SN* comparisons than the *SL-SN* comparison (Table 3). These findings suggest that the downward trend in the audited data resulted in *SL* and *SN* auditors making judgments that were more similar than the *SH* and *SN* auditors. Thus, it appears that the un-

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[20] It is worth noting that standard deviations of auditor responses in this study were generally lower than those in Kinney and Uecker's study, even though their study employed larger experimental groups. Such a result suggests greater consensus among auditors in this study and may be attributed to an alteration in the experimental instrument. We asked for a specific (95 percent) confidence interval for the investigation decision, while Kinney and Uecker did not require a specific confidence interval.

[21] A direct test of this hypothesis would require a within-subject manipulation of the high, low, and non-audited book value treatments. While a direct test is desirable, a within-subject design would suffer from several well-known and serious threats to internal validity. These threats (e.g., "testing," and "instrumentation"; see Campbell and Stanley [1963, p. 5] would have compromised the major purpose of the study: determining the effect of management assertions on auditor judgments. Thus, it was decided that an indirect test was preferable at this time. However, future research might investigate the issue with alternative experimental designs.

TABLE 2

SIGNIFICANCE LEVELS FOR COMPARISONS OF MEDIAN* AND MEAN† AUDITOR ESTIMATES

Expected Audited Value (EV)

GROUPS	*SN*	*SL*	*SH*	*LN*	*LL*
SL	.107 (.081)				
SH	.001 (.003)	.000 (.000)			
LN	.000 (.000)				
LL		.015 (.058)		.084 (.038)	
LH			.198 (.167)	.059 (.019)	.006 (.006)

Upper Bound (UB)

GROUPS	*SN*	*SL*	*SH*	*LN*	*LL*
SL	.027 (.046)				
SH	.015 (.013)	.001 (.001)			
LN	.152 (.018)				
LL		.000 (.000)		.451 (.665)	
LH			.551 (.927)	.063 (.068)	.356 (.352)

audited value influenced the *SH* auditors to a greater degree than the *SL* auditors.

Hypothesis H1.3 predicted that the difference in the frequency of implied investigations between *SH* and *SN* auditors would be greater than the difference between *SL* and *SN* auditors. The results supported this hypothesis. Assuming the high unaudited book value was realized, 100 percent of the *SN* auditors would have initiated an investigation, compared to 89 percent of the *SH* auditors. This difference was statistically significant ($\chi^2=2.86$, $\alpha<.10$). However, if the low unaudited book value was realized, 85 percent of both the *SN* and *SL* auditors would have initiated an investigation ($\chi^2=0.00$, $\alpha>.95$). Thus, the opportunity to observe the client's unaudited book values reduced the number of implied investigations *only* for the *SH* auditors.

Results: Long Information Sets

To investigate the extent to which the

TABLE 2—(*Continued*)

Lower Bound (LB)					
GROUPS	*SN*	*SL*	*SH*	*LN*	*LL*
SL	.353 (.261)				
SH	.003 (.010)	.011 (.007)			
LN	.000 (.000)				
LL		.172 (.161)		.025 (.015)	
LH			.016 (.044)	.039 (.135)	.005 (.005)

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* The nonparametric Mann-Whitney test.

† A parametric two-sample *t*-test, not assuming equal variances (in parenthesis).

TABLE 3

DIFFERENCES IN ESTIMATES BETWEEN EXPERIMENTAL AND CONTROL GROUPS*

		EV	*UB*	*LB*
SL-SN	Median	−0.90 (.107)	−1.55 (.027)	−0.37 (.353)
	Mean	−0.58 (.081)	−0.85 (.046)	−0.29 (.261)
SH-SN	Median	1.25 (.001)	0.45 (.015)	0.50 (.003)
	Mean	1.49 (.003)	1.61 (.013)	0.95 (.010)

		EV	*UB*	*LB*
LL-LN	Median	−0.23 (.084)	0.40 (.451)	−0.90 (.025)
	Mean	−0.99 (.038)	0.40 (.665)	−0.35 (.015)
LH-LN	Median	0.00 (.059)	0.40 (.063)	0.50 (.039)
	Mean	0.56 (.019)	0.54 (.068)	0.29 (.135)

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* Significance levels (in parentheses) are from the tests reported in Table 2.

relatively restrictive information set influenced auditor responses, an expanded data set was provided to three groups (*LL, LH,* and *LN*). To test the prediction (H1.4) that auditors' judgments would be affected by the additional data, the *EV, UB,* and *LB* values were compared across the short and long information sets (i.e., *SN* vs. *LN, SL* vs. *LL,* and *SH* vs. *LH*). Table 1 reveals differences across the three comparison groups that were, in general, statistically significant (Table 2).

TABLE 4

NONINVESTIGATION INTERVAL WIDTHS

GROUPS	*SN*	*SL*	*SH*	*LN*	*LL*	*LH*
Median	3.000	2.500	4.000	3.000	3.800	3.000
Mean	3.265	2.700	3.920	2.811	4.188	3.062
Std. Dev.	1.36	1.54	2.60	1.55	2.15	1.60

*Significance Levels of Differences in Noninvestigation Intervals**

GROUPS	*SN*	*SL*	*SH*
LN	.109 (.149)		
LL		.979 (.981)	
LH			.189 (.112)

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* For each comparison, the nonparametric Mann-Whitney test was performed on medians, and the parametric *t*-test (not assuming equal variances) was performed on means (in parenthesis).

For instance, differences in medians of the *EV, UB,* and *LB* values given by *SN* and *LN* auditors (respectively, 1.25, .05, and 1.0) were statistically significant at the .000, .152, and .000 levels. Overall, across both parametric and nonparametric tests, eight of nine comparisons were significant at less than 0.20, with five of those significant at less than 0.05. Consequently, when presented with the opportunity to use more than two years of audited data, the auditors appeared to have taken advantage of it.

H1.5 hypothesized that the expanded information set would contribute to increased auditor confidence, resulting in their setting narrower noninvestigation intervals. Table 4 shows that mean differences in the widths of noninvestigation intervals for the *SN* (3.265) versus *LN* (2.811) comparison and *SH* (3.920) versus *LH* (3.062) comparison were in the right direction, but the differences were only marginally significant (at $\alpha < .20$ but not $\alpha < .10$). Thus, these results provide little evidence to support the hypothesis of increased confidence when additional information is available.

A primary motivation for expanding the information set was to determine if auditors would be influenced by the unaudited information when five years of audited data were available. To examine this issue, comparisons of the control and experimental groups were made. Specifically, hypothesis H1.6 predicted that there would be no differences in the estimates for *EV, UB,* and *LB* between the *LL* and *LN* comparison and the *LH* and *LN* comparison. The results of these comparisons are summarized in the lower half of Table 3. Two observations about these results can be made. First, inconsistent with H1.6, the auditors receiving the long information sets were influenced by the unaudited values. The differences in medians and means were biased in the direction of the unaudited values (i.e., negative difference on the *LL-LN* comparison, except for *UB*, and positive differences on the *LH-LN* comparisons, except for the median *EV*). Moreover, nine of the 12 differences were significant ($\alpha<.10$).

Second, based on a comparison of responses across the long and short information sets, the long information set appears to have resulted in some moderation of the effect of unaudited values. A comparison of the upper and lower halves of Table 3 shows that eight out of 12 median and mean differences between the *LN* auditors and those receiving unaudited values (*LL* and *LH*) were less than the same differences between the corresponding groups receiving the short information sets. Similarly, the significance levels were less in eight out of 12 comparisons. These findings are consistent with the motivation behind H1.6.

H1.7 predicted that auditors receiving long information sets would not be influenced by the unaudited data, resulting in equal frequencies of implied investigations across *LN, LL,* and *LH* groups. The results indicated that if the low unaudited value had been realized, 100 percent of *LN* auditors would have initiated an investigation compared to 93 percent of *LL* auditors. This difference was *not* statistically significant ($\chi^2=1.55$, $\alpha>.20$). If the high unaudited value had been realized, 95 percent of *LN* auditors would have initiated an investigation compared to 100 percent of *LH* auditors. This difference was also *not* statistically significant ($\chi^2=1.02$, $\alpha>.30$).[22] Thus, as hypothesized, providing auditors with additional data appears to have eliminated the influence of unaudited values on the implied decision to conduct an audit investigation.

Discussion

Three results from Experiment One stand out. First, whether the auditors received two years or five years of audited information, their analytical review estimates were biased in the direction of the unaudited book values. It should be noted, however, that the estimates of the auditors in the long information groups were slightly less biased than those for the short information groups. Furthermore, differences in estimates between the control and low book value groups were slightly less than the differences between the control and high book value groups for both the long and short information sets. Nevertheless, Kinney and Uecker's results were corroborated in a slightly modified task. This corroborative evidence suggests that observing unaudited data may adversely affect auditors' estimates during analytical review.

Second, this research has provided insight into the effect of unaudited values on the auditors' implied decisions to conduct audit investigations. The use of control groups (*SN* and *LN*) provided a method to examine the differential effects that the unaudited information had on the high and low book value groups. Among the short information groups, only those auditors receiving the high book value had implied investigations that were different from the control group. This suggests that when an unaudited value is inconsistent with a trend in the audited information, the auditor's investigation decision may be disrupted, resulting in an increased risk of not finding a material error. On the other hand, among the long information groups, the frequencies of implied investigations were not significantly different across all three groups. Thus, with respect to audit investigations, which is the ultimate decision in the analytical review model proposed earlier (see Figure 1), the additional information eliminated the adverse effects of the unaudited data. It should be noted, however, that only two unaudited values (high and low) were tested. Changes in the task (i.e., amount or values of audited and unaudited information) might give different results.

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[22] Directly comparing the LL and LH auditors provides additional support for H1.7. The frequencies of implied investigations for these two groups are not significantly different ($\chi^2=0.08$, $\alpha>0.70$).

Third, the results on the hypothesized differences in widths of noninvestigation intervals between the long and short information groups indicate that amount and variance of information did not affect the confidence auditors had in their decisions. Although this finding must be considered limited given the few differences investigated, it is consistent with other research (not involving auditors) on this issue [Eggleton, 1982].

Several of the results of Experiment One implied that auditors identified the downward trend in the audited data. These results emphasize the importance of identifying time-series patterns in analytical review. Auditors' ability to recognize patterns in time-series data and make accurate extrapolations are investigated in Experiment Two.

IV. Experiment Two

Empirical Background and Research Issues

In Experiment One, the question of interest involved the influence of unaudited data on auditors' estimates of expected values and noninvestigation intervals (i.e., in terms of Figure 1, the effect of the first step on the second step). In Experiment Two, the research focused on the ability of auditors to extrapolate an expected value for an account based upon various deterministic time-series patterns (i.e., the second step in Figure 1). The importance of obtaining accurate estimates of account values has been recognized by Lev [1980, p. 525; emphasis added]: "*the crucial stage* of the analytical review process is the generation of expected, or reasonable, values of financial statement items." Given the importance of these expectations in analytical review, it is surprising that no research exists on how accurately auditors generate these expectations. Experiment Two represents an initial attempt to provide some empirical evidence concerning auditors' ability to generate accurate expected values.

Evidence from experimental studies indicates that most individuals lack the ability to make accurate extrapolations. First, a number of studies indicate that individuals experience considerable difficulty in dealing with quantitative data in an intuitive fashion [e.g., Peterson and Beach, 1967; Tversky and Kahneman, 1971, 1973; DeZeeuw and Wagenaar, 1974]. Second, individuals often use heuristic strategies that result in "nonoptimal" outcomes as prescribed by normative theory [e.g., Hogarth and Makridakis, 1981]. Third, a number of studies suggest deficiencies in the ability of individuals to extrapolate from a relatively simple time-series [e.g., Wagenaar and Sagaria, 1975; Wagenaar and Timmers, 1978, 1979; Eggleton, 1976, 1982]. Since these latter studies are most relevant to this research, they are briefly summarized.

Eggleton [1976, 1982] has conducted the only studies reported in the accounting literature that investigated intuitive time-series extrapolation. Since Eggleton's first study was exploratory and his second study achieved basically the same results, only the latter [1982] will be discussed here. Eggleton had 100 undergraduate students extrapolate the next period's value and a credible interval (i.e., a 95 percent confidence interval) based on a time-series of 12 two-digit numbers representing monthly production costs. Twelve different time-series were developed to manipulate three variables: (a) sequence—trend, random and alternating; (b) mean—high and low; and (c) variance—high and low. He found that subjects misperceived random and alternating sequences, underestimated growth rates in the trend sequence, and set credible intervals which were insensitive to statistical dependencies in the sequence [Eggleton, 1982, p. 94]. These results suggest that when performing accounting-related tasks, individuals do not accurately identify trends and make inaccurate predictions from time-series data.

In non-accounting settings, Wagenaar and his associates have conducted a number of studies concerning individuals' ability to make intuitive extrapolations from exponentially increasing time-series patterns. Most of these studies involved predicting expected values five years into the future. The results have been consistent across numerous studies involving subjects with varying degrees of mathematical skills. In comparison with a mathematical extrapolation, subjects consistently and significantly underestimate exponential growth patterns.

The task of extrapolating an expected value can be thought of as a three-step process [Eggleton, 1976]: (1) acquiring information, (2) recognizing the pattern in the time-series data, and (3) estimating the current year's expected value based upon an extrapolation of the pattern recognized in step two. Thus, pattern recognition, which has been researched extensively in psychology (see Shiffrin and Schneider [1977] for a review), plays a crucial role in the performance of the task.

One of the findings of pattern recognition research is that individuals perceive patterns as a combination of features that make up the stimulus [Anderson, 1980; Tversky, 1977]. If the stimulus is familiar, the pattern will be recognized automatically. However, if the stimulus is not familiar, the features of the stimulus must be identified and combined into a recognizable pattern. It has also been found that learned categories of stimuli improve pattern recognition [Schneider and Shiffrin, 1977; Shiffrin and Schneider, 1977]. This suggests that when individuals are repeatedly exposed to a certain type of stimulus pattern, they develop learned categories in memory which help them identify similar stimuli. Since auditors are likely to have been exposed to some time-series patterns more than others, they may have developed categories in memory that allow them to more accurately recognize frequently encountered patterns than those which are less frequently encountered.

Experiment Two extended prior research in several ways. First, most prior research involved extrapolations from exponentially increasing patterns. The present research incorporated both increasing and decreasing logarithmic, linear, and exponential patterns. Second, Simon [1978] among others [e.g., DeGroot, 1965; Chase and Simon, 1973; Einhorn, 1976] argues that task performance is associated with the individual's experience in that task domain. Since practicing auditors are experienced in making intuitive extrapolations while conducting analytical review, one might expect them to make more accurate extrapolations than those of inexperienced subjects used in previous studies [e.g., Eggleton, 1982].

Subjects and Task

The same auditors as in Experiment One were the subjects for Experiment Two, and 123 usable responses were received.[23] The auditors were randomly assigned to perform one of six extrapolation tasks involved in an analytical review

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[23] Responses were received from 127 auditors. However, four responses were not used because these auditors made obvious errors in interpreting the task (i.e., extrapolation in the wrong direction).

FIGURE 3

TASK FOR EXPERIMENT TWO

You are now an auditor conducting an analytical review of a firm's revenue account whose previous seven years' audited values are reproduced below. Note, the (000's) have been omitted.

*Functional Form**	*19X1*	*19X2*	*19X3*	*19X4*	*19X5*	*19X6*	*19X7*
LINI	$ 56,076	$ 71,370	$ 86,663	$101,957	$117,251	$132,544	$147,838
LOGI	$ 41,003	$ 65,591	$ 85,387	$101,957	$116,207	$128,707	$139,841
EXPI	$ 65,011	$ 75,532	$ 87,755	$101,957	$118,457	$137,628	$159,900
LIND	$147,838	$132,544	$117,251	$101,957	$ 86,663	$ 71,370	$ 56,076
LOGD	$162,911	$138,323	$118,527	$101,957	$ 87,707	$ 75,207	$ 64,073
EXPD	$138,903	$128,382	$116,159	$101,957	$ 85,457	$ 66,286	$ 44,014

You have no reason to expect major changes from recent historical relationships.

REQUIRED: Give your expectation of the audited value for 19*X*8 based on the previous seven years' audited values.

Expected audited value ________________.

* Each auditor received only one of the six functional forms.

of a firm's revenue account (see Figure 3). In each task, the auditors were presented with seven years of audited values of the firm's revenue account and were asked to extrapolate the current period's expected value. Additionally, they were told that there was no reason to expect any significant change in the underlying relationship existing within the data (the basic premise underlying *SAS* 23 [AICPA, 1978]).

Six deterministic functions were used to generate the revenue data. The use of such functions avoided the difficulty of introducing random or nonrandom disturbances in the revenue series and allowed the computation of deviations of the auditors' expectations from the mathematical extrapolation of the account value.

Since previous research found that individuals generally do not extrapolate accurately from an increasing exponential time-series, one task was designed to determine if auditors exhibit similar inaccuracies. Thus, a revenue time-series based on an exponentially increasing function was developed. This function was defined as $EXPI = 101{,}957 \exp\{.15X - .6\}$ (where X took on the values 1,2, . . . ,7 for years 19*X*1 through 19*X*7, respectively). This functional form was similar to prior research designs in psychology (e.g., Wagenaar and Sagaria [1975]; Wagenaar and Timmers [1978, 1979]).

To investigate auditors' ability to extrapolate from gradually increasing trends, two tasks were developed involving increasing logarithmic (i.e., a "leveling-off" pattern) and linear (i.e., a constant change pattern) trends. The exact functional forms were respectively defined as $LOGI = 101{,}957[1 + ln(.15X + .4)]$ and $LINI = 101{,}957(.15X + .4)$.

Three tasks were developed to investigate the accuracy of auditors' extrapolations from decreasing trends. To make these responses comparable with those from auditors receiving the increasing data, the decreasing trends were generated as "mirror" transformations of the increasing trends.[24] Specifically, the exponentially decreasing pattern was generated by the function $EXPD = 101{,}957\,[2 - exp\{.15X - .6\}]$, the logarithmic decreasing pattern was generated by the function $LOGD = 101{,}957\,[1 - ln(.15X + .4)]$, and the linearly decreasing pattern was generated by the function[25] $LIND = 101{,}957(1.6 - .15X)$.

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[24] The "mirror" transformations were obtained through reflection of the increasing trends across the 135-degree line centered at the Cartesian coordinates (0,1).

Hypotheses

While the hypotheses in this section are based on the literature presented earlier, they are to a large extent exploratory. Since there is no evidence as to how well auditors perform such tasks, some hypotheses are based on prior empirical results in non-auditing contexts and some are based on a combination of pattern recognition research and "informed conjecture" about the type of revenue patterns auditors are likely to see most frequently. For patterns that are observed frequently, it is expected that auditors will have learned categories in memory that allow them to identify time-series patterns and thereby make more accurate extrapolations. Specifically, the hypotheses are based on the presumption that auditors are more familiar with increasing than with decreasing trends, and they are more familiar with gradual trends (whether increasing or decreasing) than with sharp trends. There is little research that directly confirms this presumption. However, more frequent exposure to gradually increasing revenue trends is consistent with the effect that inflation would have on revenues, and it is consistent with empirical evidence of the time-series properties of revenues presented by Foster [1977].

Two hypotheses related to the three increasing time-series patterns were formulated. The first hypothesis, based on the findings of Wagenaar and his associates, indicated that individuals underestimate expected values when extrapolating from exponentially increasing time-series patterns. Since individuals with varying backgrounds have shown this tendency, it is expected that auditors would also underestimate the trend. Therefore, the following hypothesis was proposed:

> H2.1: Auditors' expected values for the *EXPI* revenue pattern will be underestimated.

The inflationary environment of recent times makes it likely that auditors would have been repeatedly exposed to moderate forms of increasing revenue patterns (i.e., ones similar to the *LOGI* and *LINI* patterns). Therefore, it was expected that auditors would extrapolate more accurately from mildly increasing patterns than from sharply increasing patterns.

> H2.2: Auditors' expected values for *LOGI* and *LINI* revenue patterns will be more accurate than auditors' expected values for the *EXPI* revenue pattern.

Regarding the accuracy of auditors' extrapolations from data exhibiting *decreasing* trends, the previous discussion is relevant. For instance, it was expected that the more frequently encountered patterns would be more easily discerned and estimated. Therefore, estimates based on logarithmic and linear decreasing data were expected to be more accurate than estimates based on exponentially patterned data.

> H2.3: Auditors' expectation for *LOGD* and *LIND* revenue patterns will be more accurate than auditors' expectation for the *EXPD* revenue pattern.

It was also expected that auditors will have encountered revenue data exhibiting increasing patterns more often than data with decreasing patterns. Consequently, it was expected that this would result in more accurate estimates of increasing patterns than decreasing patterns.

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[25] The experiment could be thought of as a 2×3 between-subject design, where the "2" represents increasing and decreasing trends and the "3" represents the exponential, logarithmic, and linear trends.

> H2.4: Auditors' expected values based on increasing revenue patterns will be more accurate than those based on decreasing revenue patterns.

Results

The first hypothesis (H2.1) predicted that auditors would underestimate expected values when extrapolating from data exhibiting an exponentially increasing pattern. The results supported hypothesis H2.1. Table 5 shows that the median (mean) value of the auditors' expectations for the *EXPI* data series was $2,778 ($5,670) below the actual value (both the median and mean were significant at $\alpha < .000$). Indeed, over 90 percent of the auditors' predictions were below the actual value. These results are consistent with previous findings in psychology and suggest that if increasing exponential patterns are encountered by auditors, underestimation is likely to occur.

H2.2 predicted that auditors receiving increasing revenue trends would be more accurate in providing estimates from linear and logarithmic patterns than from exponential patterns. Several types of evidence were evaluated to test this hypothesis. First, the auditor's extrapolations were compared to the mathematical extrapolations to identify extrapolation errors. Second, extrapolation errors for the three groups were compared to identify any significant differences. Table 5 shows that the extrapolations were underestimated by all three groups. The median (mean) errors for the three groups were as follows: *LINI*, $1 ($1002); *LOGI*, $36 ($1,627) and *EXPI*, $2,778 ($5,670). Further, the significance levels for the median errors for each group were as follows: *LINI* (.057), *LOGI* (.151) and *EXPI* (.000). This result indicates that extrapolations for two of the groups (*LINI* and *EXPI*) were significantly (in a statistical sense) in error. *LOGI* group errors were only marginally significant.

The above evidence *suggests* that auditors' extrapolations from exponential patterns were less accurate than those from either linear or logarithmic patterns. To examine this issue more closely, statistical tests of differences in extrapolation errors across groups were conducted. Table 6 shows the results of non-parametric (Mann-Whitney) and parametric (*t*-test) tests of differences in extrapolation errors. Errors for the *LINI* and *LOGI* patterns were significantly less than those for the *EXPI* pattern (i.e., for non-parametric tests, significance levels were .000 and .015, respectively). This evidence indicates that extrapolations for *LINI* and *LOGI* patterns were significantly more accurate than for the *EXPI* pattern, supporting H2.2.

The auditors' extrapolations from increasing patterns provided some other noteworthy results. For the *LINI* and *LOGI* patterns, an approximately equal number of extrapolations fell on both sides of the actual value (i.e., respectively, 57 and 53 percent of the extrapolations were underestimated), whereas for the *EXPI* series, over 90 percent of the extrapolations were underestimated. In addition, standard deviations of extrapolations for linear ($3,079) and logarithmic ($3,783) patterns were significantly ($\alpha < .01$ and $\alpha < .06$, respectively) less than the exponential pattern ($5,837), implying greater consensus among the former.

Hypothesis H2.3 predicted that extrapolations for the linear and logarithmic

TABLE 5

DESCRIPTIVE STATISTICS ON AUDITORS' EXTRAPOLATIONS*

	Pattern	*LINI* $N=21$	*LOGI* $N=15$	*EXPI* $N=21$	*LIND* $N=26$	*LOGD* $N=20$	*EXPD* $N=20$
Deterministic Time-Series	Actual Value	163,131	149,877	185,778	40,783	54,037	18,136
	Series Median	101,957	101,957	101,957	101,957	101,957	101,957
	Series Mean	101,957	96,956	106,606	101,957	106,958	97,308
	Series Std. Dev.	33,038	35,335	34,195	33,038	35,335	34,195
Auditors' Extrapolations	Median Value	163,130	149,841	183,000	41,000	54,700	27,371
	Mean Value	162,129	148,250	180,108	42,447	54,641	27,485
	Std. Dev. Value	3,079	3,783	5,837	3,365	2,304	7,474
	MSPE	.0004	.0007	.0019	.0082	.0019	.4271
	MAPE	.0073	.0137	.0306	.0438	.0230	.5155
Significance Levels for Extrapolation Errors	Wilcoxon test†	.057	.151	.000	.009	.038	.000
	t-test†	.076	.059	.000	.009	.128	.000

	Increasing Trend	*Decreasing Trend*
MSPE	.0010	.1332
MAPE	.0176	.1804

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* The Error Metrics are defined as follows:

$$MSPE=\sum_{i=1}^{N}\left(\frac{A-P_i}{A}\right)^2/N \text{ and } MAPE=\sum_{i=1}^{N}\left|\frac{A-P_i}{A}\right|/N$$

where P_i is the i^{th} auditor's extrapolation,
A is the actual deterministic value, and
N is the number of auditor extrapolations.

† One-sided test, H_0:μ=(actual value) against H_1:μ<(actual value) on the LINI, LOGI, EXPI series, and H_1:μ>(actual value) on LIND, LOGD and EXPD series.

TABLE 6
SIGNIFICANCE OF DIFFERENCES IN EXTRAPOLATION ERRORS*

PATTERNS	*EXPI*	*LINI*	*LOGI*	*EXPD*	*LIND*
LINI	.000 (.002)				
LOGI	.015 (.013)	.178 (.450)			
EXPD	.039 (.045)				
LIND		.366 (.260)		.000 (.000)	
LOGD			.560 (.781)	.000 (.000)	.180 (.497)

* For each comparison, the nonparametric Mann-Whitney test was performed on medians, and the parametric t-test (not assuming equal variances) was performed on means (shown in parentheses). The directional nature of these tests was consistent with each of the hypotheses.

decreasing patterns would be more accurate than extrapolations from the exponentially decreasing pattern. Median (mean) error values for the *LIND, LOGD,* and *EXPD* series were, respectively, \$217 (\$1,664), \$663 (\$604), and \$9,235 (\$9,349). These extrapolation errors were significant for each series (see Table 5). Similar to the analysis of increasing trends, Table 6 shows that extrapolation errors for the *LIND* and *LOGD* patterns were significantly less ($\alpha < .001$ for each case) than those for the *EXPD* pattern. Overall, these results support H2.3, indicating that auditors were less accurate when extrapolating from exponential data than linear or logarithmic data. Further analysis of the *LIND* and *LOGD* series indicated that, respectively, 60 and 65 percent of the extrapolations were overestimated in contrast to 100 percent for the *EXPD* series. In addition, standard deviations of the extrapolations implied greater consensus for the *LIND* (\$3,365) and *LOGD* (\$2,304) than for the *EXPD* (\$7,474) patterns. These differences in standard deviations were significant ($\alpha < .001$) for both comparisons.

Finally, comparisons of extrapolations across increasing and decreasing patterns were made. It was predicted (H2.4) that extrapolations would be more accurate in the tasks involving increasing patterns than decreasing patterns. This was based upon the presumption that pattern recognition and the accuracy of extrapolations would be positively enhanced for increasing patterns. A comparison of the error metrics aggregated over increasing and decreasing patterns (see Table 5) indicates that the errors were greater for the decreasing patterns. For example, the *MSPE* was .0010 for increasing patterns and .1332 for decreasing patterns. Similar differences in error metrics can be seen for each of the individual patterns (e.g., *LINI* .0004 versus *LIND* .0082). In addition, the statistical significance levels of the differences between actual and estimated were greater for decreasing trends than for increasing trends. However, in the aggregate, extrapolation errors for increasing trends were not significantly different (median, $\alpha=.307$; mean, $\alpha=.193$) from the errors for decreasing trends. Individually, only the exponential series generated a significant difference ($\alpha=.039$) between the increasing and decreasing patterns (see Table 6). Thus, it appears that auditors' ability to recognize increasing patterns was only slightly greater than their ability to recognize decreasing patterns.

Discussion

Experiment Two has shown that auditors significantly underestimated (overestimated) expected values for exponentially increasing (decreasing) revenue patterns. This result is consistent with the findings of research in non-auditing contexts and suggests that intuitive extrapolations for accounts that are rapidly changing may adversely affect audit costs and/or risks. Of course, the effect of extrapolation errors on audit costs or risks depends on the auditor's loss function. Nevertheless, this research indicates that auditors should exercise care when making intuitive extrapolations from rapidly changing time-series patterns.

The auditors' extrapolations for linear and logarithmic increasing (decreasing) revenue patterns were, in general, significantly (in a statistical sense) underestimated (overestimated). However, these extrapolations were significantly more accurate than those for the exponential patterns. In addition, the extrapolation errors for the linear and logarithmic patterns (e.g., the error metric, *MAPE*, ranges from .0073 to .0438) are small enough that intuitive extrapolations may be satisfactory for use in practice. Again, the auditor's loss function and other factors would have to be considered before drawing firm conclusions.

V. CONCLUSIONS

Before concluding with some implications for further research, it is important to discuss the limitations of this research. First, the experimental tasks were relatively simple abstractions from the more complex analytical review situations faced by practicing auditors. Second, the auditor-subjects were not randomly selected from the population of auditors. Given these two factors, it is not possible to know if the results generalize to analytical review judgments made in practice. However, the results were shown to be consistent with prior empirical evidence reported in the accounting and psychological literatures. Therefore, the results are sufficient to suggest further research.

The results of Experiment One corroborated Kinney and Uecker's finding that auditors' noninvestigation intervals tend to be influenced by unaudited values. To the extent that these findings are characteristic of judgments made in practice, analytical review may result in greater audit risks or costs. This suggests the need for two lines of future research. First, there is a need for analytical and empirical research aimed at determining more precisely the effect of auditors' use of unaudited account values on audit risks and costs. For example, the authors are currently involved in analytical research which will provide insight about the effect of using unaudited account values on audit risks given a variety of analytical review conditions. A more complete understanding of the conditions that give rise to changes in audit risks and costs should help auditors set normative guidelines regarding the use of unaudited values during analytical review.

Second, there is a need to investigate decision aids that preclude the use of unaudited data in the formation of noninvestigation intervals. One such decision aid would be statistical analytical review approaches such as regression analysis [Stringer, 1975]. Statistical decision aids would eliminate the use of management assertions to establish noninvestigation intervals by precluding unaudited information from being used as an input to the model. Precluding the use of unaudited information as an input to a judgmental analytical review is more difficult, since such information is readily available during the audit. However, research could be directed at determining the effectiveness of structured decision approaches where, for example, analytical review would be conducted by auditors who do not have access to unaudited information, or requiring the formulation of noninvestigation intervals to be performed prior to the availability of unaudited information. Structured decision approaches have proven useful in other audit areas [Elliott, 1980; and Willingham, 1981].

Another important finding of Experiment One was the elimination of the effect of unaudited information on the frequency of implied investigations when the amount of audited information was increased. There are two implications of this finding. First, since the longer information set is more consistent with the amount of information that is normally available during an audit, it may be that in more complex and realistic task situations, auditors' judgments are not affected by unaudited data. Extending this research to more complex tasks could provide important insight about the effect of unaudited information on analytical review judgments.

Second, increasing the amount of information may have caused the auditors to perceive a different trend in the audited data. That is, the short information set contained a downward trend, while the long information set was more of an alternating pattern (although the last two years were identical in both sets). On the basis of this research, it is not possible to know whether the change in the amount of information reduced the effect of unaudited data on the frequency of implied investigations or whether it was due to the patterns recognized by the auditors. Future research should be conducted to determine the effect of various trends in audited information.

A variety of other changes in the task for Experiment One might prove insightful for future research. Analytical review is a complex task involving the interpretation of financial information which can be affected by factors such as relationships within the data and background information about the company. Varying these factors could cause the auditor to frame the task differently, resulting in different judgments. For example, auditors might view the analytical review differently if a change in gross profit was due to stable revenue and varying cost of sales, versus an opposite relationship. Similarly, the type of company involved (e.g., fast growth versus stable, or management reputation) might also cause different judgments. Tversky and Kahneman [1981] present evidence that minor changes in task background can cause different judgments, and this issue merits research in the analytical review task.

The results of Experiment Two indicated that auditors significantly underestimated (overestimated) expected values when the financial data exhibited an increasing (decreasing) exponential pattern. Although exponential revenue patterns may be infrequent, situations such as major changes in firm strategy, new products, or new markets could produce this type of pattern. Under these circumstances, judgmental extrapolations of past data could reduce the effectiveness of analytical review. This finding suggests three issues for future research to address. First, since our task was relatively simple, it is important to determine if underestimated (overestimated) expected values will be generated in more complex task situations. Second, will different data displays, such as graphical depictions, reduce this underestimation (overestimation)? While computerized graphics make such displays more easily obtainable, past research has found the same underestimation with graphical displays [Wagenaar and Timmers, 1979]. Third, in situations exhibiting exponential trends, underestimation (overestimation) could be consistent with the auditor's loss function. Research designed to determine the perceived consequences underlying auditors' estimations could provide a more complete understanding of the judgments investigated here.

Finally, both experiments found evidence that auditors were able to identify various patterns in financial data. This evidence suggests that pattern recognition is an important part of the auditor's analytical review. Future research should investigate auditors' ability to recognize patterns when more complicated relationships are present in the financial data. For example, Eggleton [1982] found that alternating patterns were confused with random patterns by student subjects. It would be of interest to determine if experienced auditors reveal similar errors in pattern recognition.

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THE ACCOUNTING REVIEW
Vol. LX, No. 4
October 1985

Strategic Considerations in Auditing

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ABSTRACT: A simplified audit setting is used to illustrate the crucial nature of strategic interactions in audit planning and in assessing audit risk. Unlike single-person decision-theoretic models which essentially represent games against nature, the model developed here allows a prospective audit to influence the behavior of the auditee. We reformulate the problem in a game-theoretic framework with rational players which (1) encompasses strategic factors for both the auditor and auditee, (2) is consistent with behavioral hypotheses regarding the effect of an audit, and (3) is consistent with certain audit phenomena such as randomized strategies. An illustration is provided which demonstrates several points. First, both the auditor and the auditee may frequently use a randomized strategy. Second, the auditor's strategy depends on the interaction between the accounting control system and the auditee's actions. In addition, the use of traditional single-person decision theory may frequently cause errors in estimating audit risk because it fails to consider audit influences on the auditee. Settings in which decision theory may serve as an adequate model simplification are also considered.

I. INTRODUCTION

THE topic of audit risk assessment has been given increasing attention. Recently, the Auditing Standards Board issued SAS No. 47, "Audit Risk and Materiality in Conducting an Audit" [AICPA, 1983], which requires auditors to plan the audit such that audit risk is limited to a low level appropriate for issuing an opinion on the financial statements. Audit risk is defined by SAS No. 47 as the risk that the auditor may fail to modify the audit report when the financial statements are materially misstated. Cushing and Loebbecke [1983] review the two predominant methods of assessing audit risk. The first approach, labelled *risk analysis*, "focuses directly on the assessment and quantification of audit risk" (p. 23).[1] The second approach, labelled *audit modeling*, "treats audit risk as merely one element within a more comprehensive modeling framework" (p. 24). This second approach, relying on traditional techniques of single-person decision theory, views audit risk as an output of the audit plan rather than as an input.[2] The development by Kinney [1975a] represents a well-known example of the decision theory approach to auditing.

The risk analysis model is often criticized as being seriously incomplete and *ad hoc* (see Cushing and Loebbecke [1983] for a critique). The audit modeling ap-

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[1] Warren [1979] discusses practical issues in assessing audit risks and applying this approach.

[2] Henceforth, we use the term "decision theory" to indicate single-person settings and "game theory" to indicate multiperson decision settings.

Helpful comments were provided by Rick Young, Evelyn Patterson, participants at Accounting workshops at UCLA, Berkeley, Michigan State, and the University of Texas at Austin, and by anonymous reviewers. Financial support was provided by research fellowships from Deloitte Haskins & Sells and Coopers & Lybrand.

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Manuscript received August 1984.
Revision received January 1985.
Accepted March 1985.

proach, while suffering from rather severe implementation problems, is often viewed as a superior method of conceptualizing the audit problem and has enjoyed preeminence in academic studies in recent years.[3] While the audit modeling approach has advanced our understanding of auditing issues significantly, we argue here that it is seriously deficient as a tool for understanding auditor behavior and for determining audit risk. This criticism of the decision theory approach is based on a very simple proposition: *it does not allow the audit to influence the behavior of the auditee* (hereafter, client), a fact recognized by the auditor which in turn influences the planning of the audit.[4]

These behavioral influences of audits have long been recognized (see, for example, Churchill [1962] or Carmichael [1970]). Churchill, Cooper and Govindarajan [1982] empirically document the *anticipatory* effects of an audit. They argue that:

> if (a) a set of criteria were introduced, (b) a pending audit against these criteria were announced, and (c) penalties for nonconformance were established, explicitly or implicitly, then a behavioral change would take place even during the anticipation phase of these audits [p. 71].

Of course, auditors also recognize these behavioral effects and plan the audit accordingly. These plans frequently include some randomization (for example, where only certain divisions of a firm are audited, but these divisions are not announced in advance).[5] Because decision theory is designed to represent decision making under uncertainty where "nature" is the only "opponent," it is fundamentally inadequate to deal with audit planning where these behavioral effects occur. Modeling these behavioral influences requires consideration of a multiperson environment with strategic interaction, i.e., game theory. In fact, any model of the audit problem which uses an agency framework explicitly relies on game theory.[6]

A change in approach from single-person decision theory to game theory can radically alter how audits are planned and audit risk is evaluated.[7] We provide an illustration which demonstrates several points:

(1) Even in our stylized setting, the auditor will frequently use a randomized strategy (i.e., sometimes additional auditing will be used,

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[3] See, for example, Kaplan [1973], Scott [1973], Kinney [1975a, 1975b], Kinney and Warren [1979], and Cushing and Loebbecke [1983]. Behavioral studies in auditing often rely on the decision theory approach and focus on inputs to the model such as subjective probability distributions [Solomon, 1982] and calibration [Tomassini, et al., 1982].

[4] Evans [1980] demonstrates, in an agency framework, that the contractual specification of the audit influences the effort expended by the agent. This result is consistent with our primary theme.

[5] See Antle [1982] for a discussion of randomized strategies in auditing. Fellingham, Newman and Kwon [1984] discuss randomization in a principal-agent game.

[6] Antle [1982] and Wilson [1983] emphasize the multiperson characteristics of the audit setting. Demski and Swieringa [1974] consider a multiperson setting in which risk sharing is of primary importance.

[7] For example, the determination of sampling rules and the evaluation of sample outcomes in auditing are affected significantly by the shift from decision theory to game theory. Classical hypothesis testing is no longer appropriate in a game setting, as Dresher and Moglewer [1980, p. 503] emphasize:

> . . . frequently the sample is obtained in a competitive environment, i.e., the sample or the population or both may have been tampered with to accomplish some objective. Further, the extent of tampering is not known. For example, any sample inspection, sample inventory, sample audit, or any sampling performed to verify conformance to some rule or regulation may be subject to tampering. In such instances, the sampler must protect himself not only against the possibility of sample or population tampering, but also against the possible use of the sampling errors as a means of concealing this tampering. *Classical statistical hypothesis testing is not applicable to sampling in a competitive environment, since such testing assumes only stochastic situations, i.e., all uncertainties are due to chance and there is no deliberate tampering.* (Emphasis added.)

and sometimes it will not be used). Further, the client may randomize in response. Randomization is *never* preferable to pure (non-randomized) strategies in a single-person setting.

(2) The auditor's strategy critically depends on the interaction between the accounting control systems and the client's actions.

(3) The "solution" to the audit game may be Pareto dominated by alternative strategies which are unattainable.

(4) Traditional single-person decision theory frequently may result in estimation errors regarding the extent of audit risk by failing to consider audit influences on the client.

(5) Depending on the situation, almost any strategy may be appropriate. Thus, it is difficult to evaluate the "correctness" of different observed audit strategies in various settings.

Perhaps the skepticism of practicing auditors toward traditional decision theory is based only in part on its implementation problems. An alternative explanation is that auditors intuitively understand the strategic nature of the audit and find decision theory inadequate for their purposes.

In Section II, we describe a simple auditor-client game which captures the importance of strategic interactions. Section III provides a number of examples of solutions and a sensitivity analysis. A criticism of traditional risk assessment techniques is contained in Section IV. Decision theory as a form of model simplification is considered in Section V. Extensions and conclusions are discussed in Section VI.

II. THE AUDITOR/CLIENT GAME

The audit setting we consider here is deliberately simple. We construct a stylized audit environment which illustrates the conceptual issues involved in strategic interactions without excessive complexity. Our purpose is *not* to propose this specific model as a guide to auditors but rather to illustrate problems with the alternative, well-accepted paradigm of decision theory. Indeed, the decision theory model is very difficult to use in real settings except in piecemeal fashion; the game theory approach promises to be equally intransigent in application. Nevertheless, game theory is far better suited to the audit problem from a *conceptual* perspective.

Consider a setting in which the auditor has two decisions to make. First, (s)he chooses between audit procedures A_1 and A_2 (a simple dichotomous choice) and subsequently decides to qualify the audit opinion (Q) or not (NQ).[8] The client chooses between actions E_1 and E_2. We characterize this as providing more effort (E_1) or less effort (E_2), but alternative representations could be the level of care (high/low) taken in processing accounting information, or the existence of collusion/no collusion. We assume that the client's effort complements the internal control system such that the probability of material error is lower given higher effort. Further, we assume that expending less effort is preferred (*ceteris paribus*) by the client to expending more effort.

In addition, we characterize the auditor's choices, A_1 and A_2, as "extending audit procedures" and "not extending audit procedures," respectively. Because additional audit work is costly, the auditor is assumed to prefer A_2 to A_1, *ceteris paribus*. We assume that the auditor's action A_1 (extending procedures) will perfectly reveal whether the client has selected E_1 or E_2, although it may not perfectly reveal whether there is a material error. Selection of A_2 (not extending audit procedures) is assumed (for simplicity) to prevent the auditor from *observing* whether the client has selected E_1 or E_2.

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[8] We deliberately ignore many of the institutional characteristics of audits such as review of internal control, test of details, substantive tests, etc., to focus on the primary issue at hand. Inclusion of these considerations would not alter our central point, but would make the model unmanageable.

As in Kinney [1975a], we assume there are various potential costs associated with the decisions of the auditor and client. If the auditor qualifies the audit opinion incorrectly, there is a possible loss of both client and reputation. Failure to qualify given a material error also creates potential costs if the error is later discovered, i.e., loss of reputation and future fees. Extending audit procedures also imposes a cost on the auditor. The client may incur a variety of costs: the cost of expending effort (versus not expending effort), the cost of a qualified opinion, expected costs of a material error when discovered (or confirmed), which may depend on whether the audit was qualified or not qualified.[9] The following notation is used to summarize these costs:

C_1 = the auditor's expected cost of qualifying given no material error;

C_2 = the auditor's expected cost of not qualifying given a material error;

C_A = the auditor's direct cost of extending audit tests; the direct cost of not extending audit tests is zero;

C_H = the client's direct cost of expending higher effort (E_1); the direct cost of E_2 is arbitrarily set at zero;

C_Q = the client's expected cost of a qualified opinion;

CE_Q = the client's expected cost of a material error when the opinion is qualified; and

CE_{NQ} = the client's expected cost of a material error when the opinion is not qualified.

Finally, a critical component of our model is the interaction of the client's effort and the accounting control system of the firm in determining the probability of material error. We assume that more effort (or care) reduces the probability of a material error and denote by p the conditional probability of an error if the client chooses E_1 and by q the conditional probability of an error given E_2, where $q \geq p$. Later, we vary p and q to test the sensitivity of various solutions to our game. One interpretation of this characterization is that if both p and q are low, the internal control system is very effective regardless of the effort taken by the client. If both are high, the internal control system is particularly weak, again independent of the client's effort. If p is low while q is high, the control system is highly dependent on the client's effort.[10] We consider a variety of scenarios in the next section.

The auditor-client game as we have described it is one of *imperfect information* (see Rapoport [1970]). This class of game is distinguished by the inability of players to observe some moves made by opponents. Several simplifying assumptions should be emphasized. First, all players know the preferences and payoffs of their opponents. Second, the auditor knows the values of p and q before selecting A_1 or A_2; thus the model (as formulated) is more applicable to the substantive testing stage of an audit where the implications of the internal control system conditional on the client action are known. Third, the auditor and client agree on all model parameters and view each other as rational. Relaxing these assumptions would not alter our basic points but would significantly complicate the model and would detract from our central theme.[11]

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[9] We differentiate between the client's cost of an error given auditor qualification (CE_Q) *vis-a-vis* no qualification (CE_{NQ}) based on the probability of error discovery. Although the realized cost of an error (when discovered) may be viewed as the same in either case, the *expected* cost is assumed to be much lower given no qualification because the probability of discovery (with attendant penalties) is likely to be lower than if a qualification occurred.

[10] The internal control system in our model is viewed as fixed, i.e., independent of the client's effort (although the probability of a material error obviously depends on the action taken by the client). Thus, the probability of an error can be viewed as a function of both the client's action and some random influence. An interesting extension to this model would be to treat the client's effort as influencing the internal control system. Thus, higher effort might be viewed as altering both p and q. The client could be characterized as taking two actions: first, selection of an internal control system, and second, effort to prevent material errors given a control system in place. The auditor could then observe the internal control system, but would still be unable to observe the client's second action. Our model can be viewed as an analysis of the second set of decisions by the auditor and client.

In addition, we have formulated the problem as one of minimizing expected costs, consistent with Kinney [1975a, 1975b]. In a more realistic setting, the audit fee (which here is viewed as predetermined and fixed) would be endogenously determined (as a result of a market equilibrium, for example), as in most agency models of the audit problem (see Antle [1982, 1984]). Such a formulation would alter certain of our assumptions regarding relative payoffs to the auditor. For example, we have implicitly assumed that the auditor's cost of issuing a correct opinion is zero (other than the direct cost of extending audit procedures) regardless of the type of opinion. When (net) audit fees are endogenously determined in an agency model, the symmetry between the costs of a correct qualified opinion and a correct unqualified opinion does not necessarily hold (see Antle [1982, 1984]). Again, however, this assumption is made strictly to simplify the analysis. Relaxing it would not alter any of our qualitative results. To incorporate audit fees, we would need to introduce considerable complexity, including an additional player (the owner of the audited firm), and deal with several issues of tangential interest, such as subgame dominant strategies on the part of the auditor and client (see Antle [1982] and Baiman, Evans and Noel [1984]). While we view these issues as important to the ultimate goal of a thorough game-theoretic treatment of the audit, they would only detract from the points being made here.

We characterize the game in extensive (tree) form in Figure 1.

In Figure 1 the auditor is characterized as taking the first act (A_1 or A_2), which technically is not the actual sequence. However, the client's choice of E_1 or E_2, based on whether the auditor has chosen A_1 or A_2, is connected by a dotted line, which indicates that the client cannot distinguish which branch (s)he is on and thus must make the same move for either branch (an unconditional strategy). This representation is strategically equivalent to one in which the client moves first and the auditor then decides whether or not to extend audit procedures. Similarly, if the auditor chooses not to extend procedures, (s)he will be unable to determine whether the client has selected E_1 or E_2; thus, a dotted line connects the decision nodes of the auditor on the A_2 branch of the tree.

The expected payoffs of the auditor and the client are based on the expected costs previously defined, along with the probability of incurring those costs. For example, consider the strategy combinations: the client chooses E_1, and the auditor chooses A_2 and Q (the uppermost branch of the tree). The auditor's payoff will be the expected cost of incorrectly

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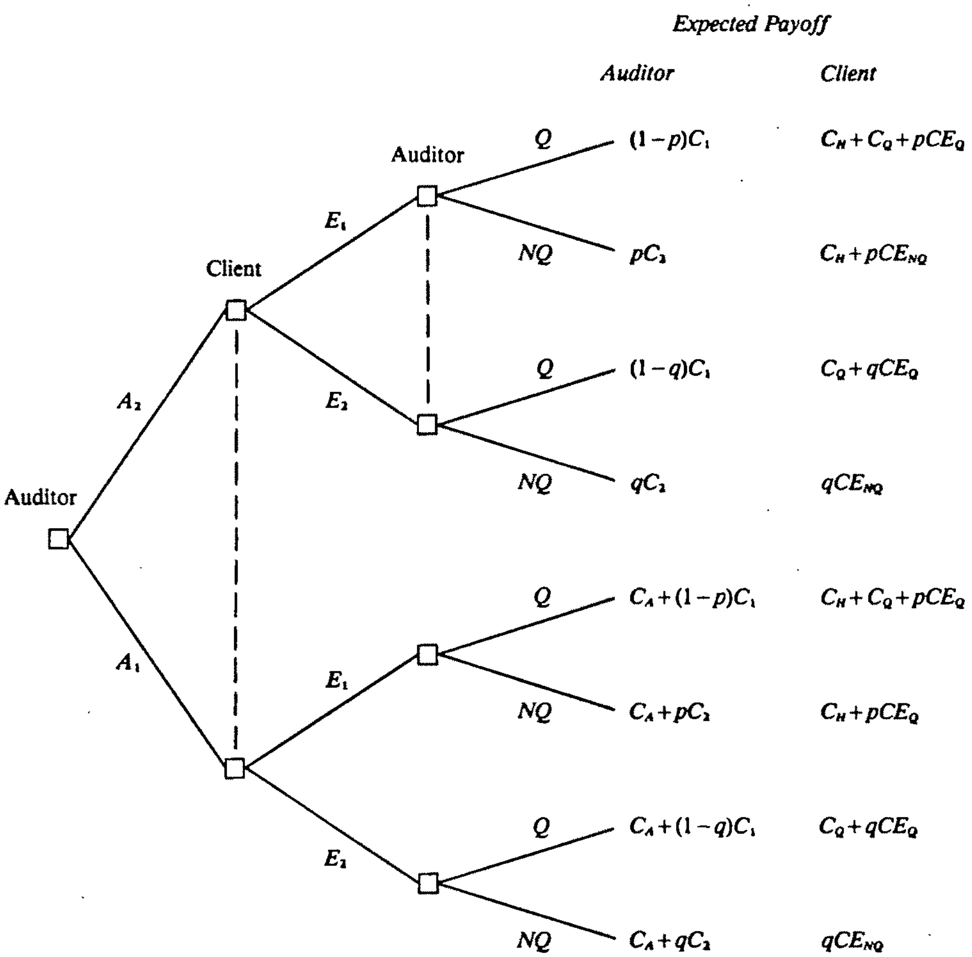
[11] Many of these simplifying assumptions have been investigated by game theorists. For example, Harsanyi [1967, 1968a, 1968b] has shown that lack of knowledge of preferences or payoffs does not alter the basic representation of a game. In addition, we investigate in Section IV the implications of the auditor not viewing the client as a rational opponent (in the sense that the client's decision is treated as independent of the auditor's strategy).

FIGURE 1
AUDITOR-CLIENT GAME IN EXTENSIVE FORM



qualifying times the probability of no error given E_1 is selected by the client: $(1-p)C_1$. Similarly, the client's total expected cost is the expected cost of E_1 (C_H), the expected cost of qualification (C_Q), and the expected cost of an error given qualification (CE_Q) times the probability of an error given E_1 (p); i.e., total expected cost equals $C_H+C_Q+CE_Q(p)$. Other payoffs are computed in a similar fashion.

This game is more easily analyzed in strategic form (see Shubik [1982]). The available strategies of the client are simply E_1 or E_2. The possible strategies of the auditor, somewhat more complex due to the sequential nature of the game, are:

(A_1,Q,Q)—extend, qualify if the client chooses E_1, qualify if the client chooses E_2;
(A_1,Q,NQ)—extend, qualify if the client chooses E_1, do not qualify if the client chooses E_2;

TABLE 1

AUDITOR-CLIENT GAME IN STRATEGIC FORM

		Client Strategies	
		E_1	E_2
Auditor Strategies	A_1,Q,Q	$(C_A+(1-p)C_1, C_H+C_Q+pCE_Q)$*	$(C_A+(1-q)C_1, C_Q+qCE_Q)$
	A_1,Q,NQ	$(C_A+(1-p)C_1, C_H+C_Q+pCE_Q)$	(C_A+qC_2, qCE_{NQ})
	A_1,NQ,Q	(C_A+pC_2, C_H+pCE_{NQ})	$(C_A+(1-q)C_1, C_Q+qCE_Q)$
	A_1,NQ,NQ	(C_A+pC_2, C_H+pCE_{NQ})	(C_A+qC_2, qCE_{NQ})
	A_2,Q	$((1-p)C_1, C_H+C_Q+pCE_Q)$	$((1-q)C_1, C_Q+qCE_Q)$
	A_2,NQ	(pC_2, C_H+pCE_{NQ})	(qC_2, qCE_{NQ})

* (Auditor payoff, Client payoff)

(A_1,NQ,Q)—extend, do not qualify if the client chooses E_1, qualify if the client chooses E_2;
(A_1,NQ,NQ)—extend, do not qualify if the client chooses E_1, do not qualify if the client chooses E_2;
(A_2,Q)—do not extend, qualify; and
(A_2,NQ)—do not extend, do not qualify.

Notice that if the auditor chooses not to extend audit procedures, the qualify/no qualify decision cannot be contingent on the client's choice of E_1 or E_2, since the auditor does not know that choice (thus, the dotted line in the extensive form of the game). The strategic form of the game is provided in Table 1, with associated payoffs.

It is straightforward that some of the auditor strategies are dominated. For example, (A_1,Q,Q) is always less desirable than (A_2,Q) since, if the auditor plans to qualify independent of the outcome of extended auditing, additional audit costs should be avoided. Similarly, (A_1,NQ,NQ) and (A_1,Q,NQ) are dominated strategies. Regardless of the client's strategies, the auditor will never choose these strategies (see the Appendix for proof). Thus, the strategic form of the game can be reformulated as shown in Table 2.

The auditor now has three pure strategies: (A_1,NQ,Q), (A_2,Q), and (A_2,NQ). The first uses additional audit information in an intuitive fashion (no qualification if the agent chooses high effort (E_1), qualification otherwise). Of course, the solution to this game depends critically on parameter values, and as we demonstrate later, almost any solution is possible.

The solution concept used for this game is that of a *Nash equilibrium*: specifically, a vector of strategies (one for the auditor and one for the client) such that no player, assuming the other is committed to his (her) strategy, can increase his (her) payoff by unilaterally changing strategies (see Shubik [1982] for a more detailed discussion). There will always exist at least one such solution, although it need not be pure. That is, each player may choose to randomize between two pure strategies (many of the examples we

TABLE 2
AUDITOR-CLIENT GAME IN REDUCED STRATEGIC FORM

		Client Strategies	
		E_1	E_2
	A_1,NQ,Q	$(C_A+pC_2,C_H+pCE_{NQ})^*$	$(C_A+(1-q)C_1,C_Q+qCE_Q)$
Auditor Strategies	A_2,Q	$((1-p)C_1,C_H+C_Q+pCE_Q)$	$((1-q)C_1,C_Q+qCE_Q)$
	A_2,NQ	(pC_2,C_H+pCE_{NQ})	(qC_2,qCE_{NQ})

* (Auditor payoff, Client payoff)

consider in the next section exhibit this characteristic). Thus, the auditor may choose to play (A_1,NQ,Q) with probability 1/2 and (A_2,NQ) with probability 1/2. Similarly, the client may randomize over E_1 and E_2. Random strategies are often observed in real audit settings, but are *never* strictly preferred to pure strategies in a game against nature (the decision theory approach).[12] In other words, the existence of randomized strategies raises a serious question regarding the legitimacy of traditional decision theory modeling in auditing.

III. EXAMPLES OF THE AUDITOR-CLIENT GAME

To illustrate solutions to the auditor-client game, we require specific parameters for the various costs in the payoff matrix, along with estimates of conditional error probabilities, p and q. We make the following assumptions about the various costs:[13]

$$C_1=20,\ C_2=90,\ C_A=5,\ C_H=35,$$
$$C_Q=20,\ CE_Q=200,\ CE_{NQ}=40.$$

We wish to emphasize that these are not intended to be a faithful compilation of realistic costs (or, except loosely, of relative costs). Estimating these parameters appears to be a major problem with the decision theory approach which is only compounded using game theory (due to the need to estimate client costs under various scenarios). But this is not crucial for our purposes, since for many cost estimates we could find values for p and q which would alter the strategies of both the auditor and the client. The reduced strategic form of the game with cost parameters assigned is shown in Table 3.

We illustrate the nature of a Nash equilibrium by considering two specific games where the values of p and q are assigned. In the first, shown in Table 4, p is .05 and q is .15. In this game, the internal control system can be viewed as very effective regardless of the effort expended by the client. If the client selects E_1 (high effort), there is only a small

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[12] See Ferguson [1967] for a proof. Note that randomized strategies may be "optimal" in a decision theory setting if, for example, randomization occurs over two pure optimal strategies with equal payoffs, but randomized strategies will never strictly dominate the pure strategies.

[13] These costs are represented here in a very simplified fashion. For expositional ease, we represent both auditor and auditee as risk-neutral (as does Kinney [1975a]); this assumption has no impact on the qualitative conclusions of the model but simplifies the analysis considerably. The specific parameter values of the various costs are also of little import to our central theme. We arbitrarily set them and show that the optimality of various strategies depends crucially on the interaction of internal control systems and client effort. This result generalizes to a wide range of parameter values.

Table 3

Auditor-Client Game in Reduced Strategic Form with Cost Parameters Assigned

		Client Strategies	
		E_1	E_2
Auditor Strategies	A_1,NQ,Q	$(5+90p,35+40p)$*	$(5+(1-q)20,20+200q)$
	A_2,Q	$(20(1-p),55+200p)$	$((1-q)20,20+200q)$
	A_2,NQ	$(90p,35+40p)$	$(90q,40q)$

* (Auditor payoff, Client payoff)

Table 4

Auditor-Client Game in Reduced Strategic Form with $p=.05$, $q=.15$

		Client Strategies	
		E_1	E_2
Auditor Strategies	A_1,NQ,Q	(9.5,37)*	(22,50)
	A_2,Q	(19,65)	(17,50)
	A_2,NQ	(4.5,37)	(13.5,6)**

* (Auditor payoff, Client payoff)
** Nash equilibrium

probability (.05) of material error; if not, the probability of a material error is only .15. The unique Nash equilibrium of the game is for the auditor to not extend audit procedures and not qualify, while the client selects low effort. The value of the game is 13.5 for the auditor (recall that this represents total expected *costs*) and six for the client. Of course, the auditor prefers the client to select E_1 but cannot enforce that choice. The low error probabilities result in minimal required auditing. The client, responding to this knowledge, chooses low effort levels since effort is costly and produces minimal benefit in terms of reduced error probability.

In the second game, shown in Table 5, p is .05 and q is .40. The internal control system is imperfect (there is a positive probability of material error regardless of the client's effort) and displays high interaction with the client's effort. Thus, if the client chooses E_1, the error probability is relatively low (.05), whereas E_2 creates a significant chance of error (.40). This game is illustrated because the unique Nash equilibrium involves randomized strategies. The auditor chooses (A_1,NQ,Q) with probability 1/4 and (A_2,NQ) with probability 3/4, whereas the client chooses E_1 with probability 19/24 and E_2 with probability 5/24.[14] The expected "value" of this game is 11.1 for the auditor $(1/4[9.5(19/24)+17(5/24)]$

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[14] For solution techniques in deriving randomized Nash equilibria, see Luce and Raiffa [1957].

TABLE 5
AUDITOR-CLIENT GAME IN REDUCED STRATEGIC FORM WITH $p=.05$, $q=.40$

		Client Strategies	
		E_1	E_2
Auditor Strategies	A_1,NQ,Q	(9.5,37)*	(17,100)
	A_2,Q	(19,65)	(12,100)
	A_2,NQ	(4.5,37)	(36,16)

* (Auditor payoff, Client payoff)
Note: Nash equilibrium requires randomized strategies. The auditor plays 1/4 (A_1,NQ,Q); 3/4 (A_2,NQ). The client plays 19/24 E_1; 5/24 E_2.

+3/4[4.5(19/24)+36(5/24)]) and 37 for the client (19/24[37(1/4)+37(3/4)]+5/24[100(1/4)+16(3/4)]).

Table 6 contains a sensitivity analysis of the effect of varying p and q on the auditor's and client's strategies. (All the equilibria in Table 6 are unique.) We continue to require $p<q$ in all cases, but vary each over a wide range. As is apparent from the table, a variety of pure and randomized strategies may arise. In fact, the only pure strategy which *never* occurs for our parameter values is for the auditor to choose (A_1,NQ,Q). Extended audit procedures, if selected, are always included as a part of a randomized strategy (although this occurs for a wide variety of parameter (p and q) values). Note also that, due to the discrete nature of the strategies, small changes in p or q can cause significant shifts in strategy. Consider games 12 and 13, for example. A shift of q from .15 to .20 (holding p at .05) causes the auditor to change from (A_2,NQ) to (A_2,Q) since the expected costs due to probable material error (the client strategy in both cases is E_2) increases significantly.

It should also be noted that the Nash equilibrium of some of these games is Pareto dominated by other (unachievable) solutions. To illustrate this, consider the game where p is .15 and q is .20, shown in Table 7 (Game 28 in Table 6). The Nash equilibrium is (A_2,Q) for the auditor and E_2 for the client resulting in expected costs of 16 for the auditor and 60 for the client. Of course, both would prefer the strategies (A_2,NQ) and E_1, resulting in expected costs of 13.5 (auditor) and 41 (client). However, this solution is unachievable. If the auditor commits to the (A_2,NQ) strategy, the client will choose E_2 since $8<41$. The auditor's expected cost would then be 18. The auditor, since (s)he is not extending audit procedures, has no way of verifying the strategy of the client and thus no means of enforcing the client's commitment to expend high effort.

Of course, given the arbitrary nature of the cost parameters in these examples and the simple nature of this game, these results should not be taken literally. Nevertheless, they do illustrate the inherent strategic nature of the audit problem and the rationality of observations made by behavioralists regarding the incentive effects of auditing.

In the next section, we consider the issue of audit risk and explicitly compare the decision theory approach with the game theory approach used here.

IV. AUDIT RISK

Although professional auditing pronouncements typically define audit risk as

TABLE 6
SENSITIVITY ANALYSIS AS p AND q VARY

Game	p	q	*Auditor Strategy**			*Client Strategy**		*Auditor Payoff (Cost)*	*Client Payoff (Cost)*
			(A_1,NQ,Q)	(A_2,Q)	(A_1,NQ)	E_1	E_2		
1	0	.05	0	0	1	0	1	4.5	2
2	0	.10	0	0	1	0	1	9	4
3	0	.15	0	0	1	0	1	13.5	6
4	0	.20	0	.84	.16	.09	.91	16.36	51.88
5	0	.25	.42	0	.58	.33	.67	15	35
6	0	.30	.34	0	.66	.62	.38	10.38	35
7	0	.40	.23	0	.77	.79	.21	7.5	35
8	0	.60	.09	0	.91	.89	.11	5.87	35
9	0	.80	.02	0	.98	.93	.07	5.29	35
10	0	1.00	0	0	1	1	0	0	35
11	.05	.10	0	0	1	0	1	9	4
12	.05	.15	0	0	1	0	1	13.5	6
13	.05	.20	0	1	0	0	1	16	60
14	.05	.25	0	.84	.16	.34	.66	16.36	60.63
15	.05	.30	.37	0	.63	.62	.38	13.15	37
16	.05	.40	.25	0	.75	.79	.21	11.06	37
17	.05	.60	.11	0	.89	.89	.11	9.88	37
18	.05	.80	.03	0	.97	.93	.07	9.46	37
19	.05	1.00	0	0	1	1	0	4.5	37
20	.10	.15	0	0	1	0	1	13.5	6
21	.10	.20	0	1	0	0	1	16	60
22	.10	.25	0	1	0	0	1	15	70
23	.10	.30	.40	0	.60	.62	.38	15.92	39
24	.10	.40	.27	0	.73	.79	.21	14.63	39
25	.10	.60	.13	0	.87	.89	.11	13.89	39
26	.10	.80	.05	0	.95	.93	.07	13.63	39
27	.10	1.00	0	0	1	1	0	9	39
28	.15	.20	0	1	0	0	1	16	60
29	.15	.25	0	1	0	0	1	15	70
30	.15	.30	0	1	0	0	1	14	80
31	.15	.40	0	.63	.37	.87	.13	16.36	68.50
32	.15	.60	0	.24	.76	.93	.07	16.36	51.39
33	.15	.80	0	.09	.91	.95	.05	16.36	44.81
34	.15	1.00	0	.01	.99	.96	.04	16.36	41.32
35	.20	.25	0	1	0	0	1	15	70
36	.20	.30	0	1	0	0	1	14	80
37	.20	.40	0	1	0	1	0	16	95
38	.20	.60	0	1	0	1	0	16	95
39	.20	.80	0	1	0	1	0	16	95
40	.20	1.00	0	1	0	1	0	16	95
41	.25	.30	0	1	0	0	1	14	80
42	.25	.40	0	1	0	0	1	12	100
43	.25	.60	0	1	0	1	0	15	105

* Probability assigned is shown below each strategy.

the risk that the auditor will fail to qualify the audit opinion when a material error in the financial statements exists (see SAS No. 47 [AICPA, 1983]), decision theo-

TABLE 7

AUDITOR-CLIENT GAME IN REDUCED STRATEGIC FORM WITH $p=.15$, $q=.20$

		Client Strategies	
		E_1	E_2
Auditor Strategies	A_1,NQ,Q	(18.5,41)*	(21,60)
	A_2,Q	(17,85)	(16,60)**
	A_2,NQ	(13.5,41)***	(18,8)

* (Auditor payoff, Client payoff)
** Nash equilibrium
*** Pareto dominates Nash equilibrium but unattainable without enforceable commitments.

rists have recognized that there are two distinct types of risk: alpha risk (Type I error) and beta risk (Type II error) (see Kinney [1975a] or Cushing and Loebbecke [1983]). The alpha risk represents the probability that the auditor will qualify when there is no material error, while beta risk is the probability of not qualifying given a material error. We follow the decision theory approach and report both alpha and beta risks here.

Consider the game illustrated in Table 5, where $p=.05$ and $q=.40$. It is immediately apparent that audit risk depends critically on the strategy taken by the client. A single-person decision theory model is *incapable* of accommodating this observation. Recall that the equilibrium (randomized) strategies in this game are:

auditor: 1/4 (A_1,NQ,Q); 3/4 (A_2,NQ)
client: 19/24 E_1; 5/24 E_2

The alpha and beta risks based on these equilibrium strategies can be computed as follows:

alpha: $1/4\ [5/24(.6)]=.031$, and
beta: $1/4\ [19/24(.05)]+3/4[19/24(.05)+5/24(.40)]=.102.$

In words, the auditor will extend audit procedures with probability 1/4. If the client provides high effort, the auditor will discover that fact and not qualify (so there is no alpha risk). If the client does not provide high effort, the auditor will discover that and qualify, but there is a .6 probability of no material error despite the fact that the client did not provide high effort. The client chooses the E_2 strategy with probability 5/24. If the auditor does not extend audit procedures (with probability of 3/4), then (s)he also does not qualify and there is no alpha risk. To compute the beta risk we use the same type of reasoning. If the auditor extends audit procedures, beta risk can only occur if the client provides high effort (otherwise the auditor qualifies), which occurs with probability 19/24. The risk of incorrectly accepting the financial statements given the client provides high effort is .05. If the auditor does not extend audit procedures (with probability of 3/4), then there is a beta risk of .05 if the client provides high effort (with probability of 19/24) and .40 if the client does not provide high effort (with probability of 5/24) since the auditor never qualifies. Table 8 summarizes these results.

Translating this game setting into a one-person decision setting requires some additional suppositions. First, what assumption does the auditor make regard-

TABLE 8

ANALYSIS OF EFFECT ON ALPHA AND BETA RISK OF INCORRECT AUDITOR ASSUMPTIONS WHERE $p = .05$, $q = .40$

Assumptions		*Auditor Strategy*	*Client Strategy*	*Payoffs*	*Assessed Risk*		*Actual Risk*	
Aud.	*Client*				*Alpha*	*Beta*	*Alpha*	*Beta*
A1	C1	$1/4(A_1,NQ,Q)$; $3/4(A_2,NQ)$	$19/24E_1$; $5/24E_2$	(11.1,37)	.031	.102	.031	.102
A2	C2	(A_2,Q)	E_1	(19,65)	.6	0	.95	0
	C1	(A_2,Q)	$19/24E_1$; $5/24E_2$	(17.5,72.3)	.6	0	.877	0
A3	C2	(A_2,NQ)	E_2	(36,16)	0	.05	0	.40
	C1	(A_2,NQ)	$19/24E_1$; $5/24E_2$	(11.1,32.6)	0	.05	0	.123
A4	C2	(A_1,NQ,Q)	E_1	(9.5,37)	.30	.025	0	.05
	C1	(A_1,NQ,Q)	$19/24E_1$; $5/24E_2$	(11.1,50.1)	.30	.025	.125	.040

A1—Auditor views client as rational opponent and plays equilibrium strategy.
A2—Auditor (incorrectly) *assumes* client adopts strategy E_2.
A3—Auditor (incorrectly) *assumes* client adopts strategy E_1.
A4—Auditor (incorrectly) *assumes* client adopts strategy $(1/2E_1;1/2E_2)$.
C1—Client views auditor as rational opponent and plays equilibrium strategy.
C2—Client knows auditor's incorrect assumptions.

ing the behavior of the client? (S)he may assume that the client always provides high effort, never provides high effort, or provides high effort with probability r ***which is independent of the auditor strategy***. Second, what does the client know of the auditor's assumption? (S)he may know that the auditor has made one of the three assumptions or (s)he may (incorrectly) assume that the auditor selects an equilibrium randomized strategy. The effects of each of these combinations of assumptions are summarized in Table 8.

Consider, for example, the case in which the auditor assumes that the client's strategy is *always* E_2 (low effort).[15] Referring back to Table 5, it is clear that the auditor's optimal strategy when faced with E_2 is (A_2,Q), resulting in an expected cost of 12. But if the client *knows* that this is the auditor's assumption and corresponding strategy, the client will select E_1, resulting in an expected cost to the client of 65. The auditor's *assessed* alpha risk is .6 (based on an assumption of low effort) whereas the *actual* alpha risk is .95 (based on an optimal client response of high effort). Since the auditor always qualifies, there is no beta risk. If the client does not know of the auditor's (naive) assumption, (s)he will continue to choose the randomized strategy 19/24 E_1; 5/24 E_2. The auditor continues to assess alpha and beta risk as though the client never provides high effort, resulting in an assessed alpha of .60 and an actual alpha of .877. Notice that a randomized strategy is *never preferred* when facing a pure strategy.

In a similar manner, consider the effects of an auditor assumption that the client always provides high effort. The auditor then will choose strategy (A_2,*NQ*) with an expected cost of 4.5. If the client knows of this choice, (s)he will select E_2, with an expected cost to the client of 16. In this case, the alpha risk (assessed and actual) is zero, since the auditor never qualifies, but the assessed beta risk (.05) significantly differs from the actual (.40). The irony here is that the auditor is *always* in error if the client knows the assumption made. Assuming E_2 results in E_1; assuming E_1 results in E_2.

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[15] An assumption of E_2 is similar to the conservative approach prescribed by SAS No. 47: "If the auditor decides that he has no basis to place any reliance on internal accounting controls related to the balance or class, he would assess control risk for that balance or class as being at a maximum" [AICPA, 1983, p. 23].

The auditor may also assume some randomization scheme (much like state realization in decision theory), where there is a probability r that the client is inherently a hard worker and 1-r that (s)he is not; the probabilities are not influenced by the auditor's strategy selection. This scenario is closest to a decision theory setting since it allows a stochastic component over client effort. Notice however, that if the client knows this assumption and $r=.5$, the optimal response is E_1, as shown in Table 8. The assessed and actual alpha risks are also shown in Table 8.

V. DECISION THEORY AS MODEL SIMPLIFICATION

Given the considerable resources invested in applying single-person decision theory, one might inquire as to circumstances in which it provides efficient guidance to the auditor. If the client is not influenced by the audit in any way, decision theory is perfectly appropriate for the auditor's problem. We do not view this setting as particularly appealing.

If the audit does influence the behavior of the client, there are two possibilities to consider. First, the client may have a pure strategy. If the auditor has correct conjectures about the client's equilibrium strategy, then decision theory will result in the same decision as game theory. For example, consider the game illustrated in Table 4. The client's equilibrium strategy is E_2. With correct conjectures, decision theory will lead the auditor to select A_2,*NQ* with a resulting expected cost of 13.5. In all games with pure strategies, if the auditor has correct conjectures regarding client behavior, decision theory will lead to an optimal auditor decision. The method by which the auditor obtains these correct conjectures is problematic.

Suppose, however, the client has an equilibrium randomized strategy, such as that illustrated in Table 5. If the auditor has correct conjectures regarding the client's strategy (19/24 E_1; 5/24 E_2 in this game), decision theory implies the following payoff comparison across auditor strategies:

$$\begin{aligned} A_1,NQ,Q&: 9.5\,(19/24)+17\,(5/24)\\ &=11.0625\\ A_2,Q&: 19\,(19/24)+12\,(5/24)\\ &=17.5417\\ A_2,NQ&: 4.5\,(19/24)+36\,(5/24)\\ &=11.0625 \end{aligned}$$

Decision theory will lead to rejection of the obviously inefficient strategy A_2,*Q*. However, the auditor will be indifferent between A_1,*NQ*,*Q* and A_2,*NQ*, because each results in the same expected cost. However, only the equilibrium Nash response of 1/4 (A_1,*NQ*,*Q*); 3/4 (A_2,*NQ*) will result in a "correct conjecture" on the part of the auditor. Any other strategy will result in a change in the client's strategy. Decision theory provides no guidance in selecting this randomized strategy.

The crucial point illustrated here is that the single-person decision theory model is simply *inadequate* to deal with strategic considerations in auditing where the audit has behavioral implications for the client. For example, assessments of audit risks, both alpha and beta, are generally incorrect when based on a decision theory analysis. In fact, singular reliance on decision theory would expose the auditor to considerable risk if faced with a strategic-minded client.

VI. EXTENSIONS AND CONCLUSIONS

This analysis has presented the rudiments of an approach to audit evaluation which (1) encompasses strategic factors for both the auditor and auditee, (2) is consistent with behavioral hypotheses regarding the effects of an audit, and (3) is consistent with certain observed audit phenomena, such as randomized strategies. The approach is useful as a device for conceptualizing the audit problem; however, realistic applications of game theory require considerably more development. One area which seems particularly appropriate for auditing involves *games with incomplete information*, in which either the auditor or the client is uncertain about the preferences or exact payoffs of the opponent (see Harsanyi [1967, 1968a, 1968b]). This perspective allows incorporation of uncertainty about the nature of the game being played. For example, the client might be one of *n* types, and each type may be expected to "play" differently.

Developing a game-theoretic approach would generate an entire new class of behavioral issues, involving bargaining, strategic behavior, and the acceptability of the posited solution concept. We adopted the Nash equilibrium as a reasonable (generally accepted) solution to non-cooperative games, but various other solution concepts are available and have been evaluated in other contexts.[16] These solutions are readily amenable to experimental evaluation.

Finally, we envisage extensions to multiple strategies (or a continuous strategy space), where, for example, optimal sampling strategies can be developed. This will likely be a difficult problem in game theory, but one which is faced regularly by practicing auditors, who currently solve the problem through the use of experienced intuition and heuristics.

The shift from single-person decision to game theory is more than a small perturbation in modeling. Rather, it is a major shift in paradigms which alters the conceptual view of auditing. In the game theory model, for example, optimal strategies may be rather sensitive to parameter values. Conventional wisdom based on decision theory may be incorrect in a game setting. For example, a player faced with a rational opponent may prefer less to more costless information (see Levine and Ponssard [1977] or Baiman [1975]).

However, game theory seems much more suited to an analysis of the audit problem than single-person decision theory. Indeed, there are other areas in auditing currently being developed which could benefit from a game formulation. For example, expert systems to assist the auditor are currently being designed (see Hansen and Messier [1982]). These models are based in part on the diagnostic systems being used by medical doctors. But there is a critical difference between medicine and auditing: illnesses do not deliberately attempt to conceal symptoms; auditees may. This distinction is crucial, and failure to recognize it and incorporate strategic considerations may limit the effectiveness of any audit aid.

APPENDIX

In this appendix we show that (A_1,Q,Q), (A_1,Q,NQ), and (A_1,NQ,NQ) are dominated strategies for the auditor and thus can be eliminated from consideration, greatly simplifying the subsequent analysis.

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[16] For example, see Rapoport and Chammah [1965].

1. (A_1,Q,Q)—This strategy is dominated by (A_2,Q). If the client plays E_1, the auditor payoff is $C_A+(1-p)C_1$ under (A_1,Q,Q) and $(1-p)C_1$ under (A_2,Q). If the client plays E_2, the auditor payoff is $C_A+(1-q)C_1$ under (A_1,Q,Q) and $(1-q)C_1$ under (A_2,Q). Since

   $$C_A+(1-p)C_1>(1-p)C_1, \text{ and}$$
   $$C_A+(1-q)C_1>(1-q)C_1,$$

   we have the desired result.

2. (A_1,NQ,NQ)—This strategy is dominated by (A_2,NQ) using the same reasoning as above. In particular, note that

   $$C_A+pC_2>pC_2, \text{ and}$$
   $$C_A+qC_2>qC_2.$$

3. (A_1,Q,NQ)—To see that this strategy is dominated, consider the following relationships:

   $$X\text{: } (1-p)C_1>pC_2, \text{ and}$$
   $$Y\text{: } qC_2>(1-q)C_1.$$

The following cases are exhaustive.

(i) $X\cap Y$. Then (A_1,NQ,Q) dominates (A_1,Q,NQ).

(ii) $X\cap\bar{Y}$. Then $C_A+(1-p)C_1>pC_2$ and

$$C_A+qC_2>qC_2,$$

which imply that (A_2,NQ) dominates (A_1,Q,NQ).

(iii) $\bar{X}\cap Y$. Then $C_A+(1-p)C_1>(1-p)C_1$, and

$$C_A+qC_2>(1-q)C_1,$$

which imply that (A_2,Q) dominates (A_1,Q,NQ).

(iv) $\bar{X}\cap\bar{Y}$. Then since $p<q$,

$$(1-p)C_1<pC_2<qC_2<(1-q)C_1.$$

But $(1-p)>(1-q)$, which implies

$$(1-p)C_1>(1-q)C_1,$$

which is a contradiction.

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THE ACCOUNTING REVIEW
Vol. LX, No. 4
October 1985

Sophisticated Capital Budgeting Selection Techniques and Firm Performance

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ABSTRACT: Firms using sophisticated capital budgeting techniques (i.e., those that employ present value analysis and account for risk) should theoretically perform better than firms using naive models such as the payback period or accounting rate of return. However, previous empirical work examining this question has produced mixed results. To correct for limitations in these studies, several tests were conducted on firms that adopted sophisticated selection techniques versus a control group of firms that employed naive techniques. After controlling for differences in systematic risk, industry effects, and size, interrupted time-series tests of relative market returns were performed. Based on the results of this study we conclude that the adoption of sophisticated capital budgeting selection techniques will not, *per se*, result in superior firm performance. It is possible that the adoption of sophisticated selection techniques is one of many policies the firm pursues in the face of economic stress, and this, in combination with other policies, may help to bring about economic recovery for the firm.

I. INTRODUCTION

CORPORATE managers continually allocate resources among competing investment alternatives during the capital budgeting process. Numerous methods of financial analysis can be employed to make the decision whether to accept or reject proposed capital expenditures. The financial methods can be grouped into two basic classes—sophisticated and naive selection techniques. *Sophisticated* techniques are those that consider the risk-adjusted discounted net cash flows expected from a project. Thus, risk, cash flows, and the time value of money are considered. The net present value, internal rate of return, and profitability index are three widely used sophisticated selection criteria.[1] In contrast, *naive* methods generally do not use cash flows, consider present values, or incorporate risk in any systematic manner. Two commonly used naive selection techniques are the accounting rate of return and the payback period.

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[1] Our view is the way most have distinguished between sophisticated and naive selection techniques. However, it might be argued that truly sophisticated methods require something beyond the straight-forward application of the net present value or internal rate of return models.

The authors would like to thank Sharon Fettus for her helpful comments regarding this manuscript.

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Manuscript received October 1983.
Revisions received November 1984 and March 1985.
Accepted April 1985.

TABLE 1

PREVIOUS RESEARCH ON THE RELATIONSHIP OF FIRM PERFORMANCE AND CAPITAL BUDGETING SELECTION TECHNIQUES

Author	*Performance Measure*	*Research Method*	*Results*
Christy [1966]	Earnings per share trend	Cross-classified four groups of firms based on earnings per share trend with capital budgeting techniques.	No relationship between earnings per share trend and the use of sophisticated capital budgeting techniques.
Klammer [1973]	Operating rate of return	Multiple regression: Independent variables—capital budgeting technique, size, risk, and capital intensity.	No significant relationship between profit performance and the use of sophisticated capital budgeting techniques, but size and risk were positively related to performance.
Sundem [1974, 1975]	Value given up by not using time-state preference model	Simulation with a time-state preference model.	Net present value models with two or three risk classes are cost/benefit efficient. In highly uncertain environments the use of a payback period is rational.
Kim [1975]	Average earnings per share	Multiple regression: Independent variables—degree of sophistication of the capital budgeting process, size, risk, and capital intensity.	Positive relationship between degree of sophistication of the capital budgeting process and firm performance.
Kim [1982]	Operating rate of return	Multiple regression: Independent variables—degree of sophistication of the capital budgeting process, size, risk, and capital intensity.	Positive relationship between degree of sophistication of the budgeting process, firm performance, size and risk.

The purpose of this study is to determine the effect on a firm's market performance of switching from naive to sophisticated capital budgeting selection procedures. Theoretically, a firm should perform better if it employs sophisticated techniques than if it uses naive techniques. However, previous research [Christy, 1966; Kim, 1975, 1982; and Klammer, 1973] has produced mixed results. The results have also suffered from a variety of theoretical and methodological limitations. Accordingly, they do not provide reliable evidence of the effect of capital budgeting selection techniques on firm performance.

II. PREVIOUS RESEARCH

The trend toward greater use of sophisticated capital budgeting selection techniques has been well documented [Klammer, 1972; Moore and Reichert, 1983; Scapens and Sale, 1981; and Schall, Sundem and Geijsbeek, 1978]. At the same time, a number of studies have attempted to determine whether there is any relationship between the type of capital budgeting selection procedure employed and firm performance. These studies, by Christy [1966], Kim [1975, 1982], Klammer [1973] and Sundem [1974, 1975], are summarized in Table 1.

Prior research has provided some insight into the relationship between firm performance and the use of sophisticated versus naive capital budgeting selection techniques. However, three issues stand out in attempting to evaluate the results of previous empirical work. First, they have depended on mailed questionnaires—which have several limitations. For example, Schall and Sundem [1980, p. 10] note:

> Terminology is not precise enough for a questionnaire to discover exactly what kind of capital budgeting environment a firm operates in and what kind of methods it uses. Only detailed analysis of capital budgeting methods will generate the needed data.

Another problem with the use of questionnaires is that an individual may fill out the questionnaire without actually possessing the information desired by the investigator. In addition, without an indication of the percent of the total capital budget that is evaluated via the sophisticated technique, the results become suspect [Gordon, Larcker and Tuggle, 1979]. Other potential problems with mailed questionnaires include nonresponse bias and low response rates.

The second issue in evaluating previous empirical research concerns the experimental design used. These studies relied primarily on cross-sectional designs. However, a pure cross-sectional design cannot control for many firm-specific factors. As Kim [1975] and Klammer [1973] have pointed out, other factors such as marketing, product development, executive recruitment and training, labor relations, and so forth may have confounding effects on any measure of performance.

A third issue concerns the correct measure of firm performance. Financial economic theory indicates that the use of sophisticated capital budgeting techniques helps management maintain or increase shareholders' wealth [Fama, 1977; Gordon and Pinches, 1984; and Myers and Turnbull, 1977]. Both Kim [1982] and Klammer [1973] acknowledge the theoretical superiority of a performance measure based on the firm's common stock. However, each rejected this approach on the grounds that shareholders know little about corporate capital budgeting practices. Consequently, previous empirical research has gauged firm performance based on measures derived from accounting data which are not necessarily consistent with the goal of shareholder wealth maximization. In fact, the argument for using sophisticated capital budgeting techniques is in part an argument against the use of traditional (i.e., naive) accounting-based selection techniques.

In sum, earlier empirical studies assessing the effect of using sophisticated versus naive capital budgeting selection techniques have suffered from theoretical, statistical, and data collection problems.[2] The method employed in this study overcomes many of these problems.

III. HYPOTHESIS

A fundamental issue is when market participants learn about the policy change. If the use of sophisticated capital budgeting techniques provides benefits to shareholders, a firm's market value should increase when market participants learn that sophisticated techniques are being used. However, it is not clear when the market becomes informed about the use of sophisticated capital budgeting techniques. One line of reasoning is that information on the policy change is disseminated gradually over time. The market participants will learn about the policy change by observing the capital expenditures made by the firm. If firm *A* adopts sophisticated techniques and firm *B* does not, we would expect the gradual dissemination of information to result in the average returns of firm A, $\bar{R}_A$, over the time period which it takes for the market participants to observe the actual application of the policy change, to be greater than the average returns of firm B, $\bar{R}_B$ (i.e., $\bar{R}_A \geq \bar{R}_B$).

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[2] This is not the case with Sundem's [1974; 1975] work. However, his work did not include an empirical study but rather was based on a simulation derived from a time-state preference model.

Alternatively, it could be argued that market participants learn of the policy change at the time of its initiation. This scenario suggests that the market returns of firm A would impound the policy change information at a given point in time (e.g., in a given week, month, or year) rather than across several time periods. To accept this scenario, however, market participants must assume the firm will properly use and regularly apply sophisticated capital budgeting techniques. Even though many of the firms we initially contacted said they were using sophisticated capital budgeting techniques, upon further questioning it was apparent that such techniques were improperly used and/or used for less than 25 percent of their capital projects. (These firms were not used in our empirical study, as discussed in the next section.) Further, this immediate dissemination and recognition scenario requires that the market participants are either notified of, or are able to derive information on, the actual timing of the policy change. No evidence suggests that a discrete notification of such a policy change occurs, nor is it a trivial task for market participants to acquire this information. On the contrary, finding out about a capital selection policy change requires extensive investigation.

Given the above, we expect, other things being equal, firms adopting sophisticated capital budgeting selection techniques to outperform matching firms employing naive techniques over the time period it takes for the information on the policy change to be gradually disseminated to the market participants. The null hypothesis of interest is:

> H_0: A firm's average relative performance after the adoption of sophisticated selection techniques is *not* better than its average relative performance before the adoption of these techniques.

The alternative hypothesis is:

> H_1: A firm's average relative performance after the adoption of sophisticated selection techniques is better than its average relative performance before the adoption of these techniques.

The ideal test would be to compare a firm's average market returns over a time period when it uses sophisticated techniques with its average market returns over the same time period while it uses naive techniques. Unfortunately, this approach is not possible. The next best alternative, and the one used in this study, is to match a firm which switched from a naive to a sophisticated technique (i.e., an experimental firm) with one using a naive technique (i.e., a control firm) over the same time period. A comparison of the average relative market returns both before and after the experimental firm adopted the sophisticated technique can then be conducted. In the above hypothesis, the words "relative performance" refer to the performance of experimental firms using sophisticated capital budgeting techniques compared to the performance of matched control firms using naive selection techniques.

The use of a matched pairs approach has been employed in several studies which have attempted to assess the economic consequences of a change in management policy [Biddle, 1980; Dukes, Dyckman and Elliott, 1980]. Harrison, Tomassini and Dietrich [1983] argued, contrary to Brown and Warner's [1980] conclusion, that complicated methods (based on various types of control groups) may be more appropriate in actual settings than simpler methods. Further, Harrison, Tomassini and Dietrich [1983] found that empirical results were sensitive to the control group choice, as well as the impact period. Recognizing this problem, we employ a series of tests to examine the effect of switching from naive to sophisticated capital budgeting selection techniques on firm performance.

IV. Sample Selection

Experimental Group of Firms

To obtain a set of firms that switched from naive to sophisticated selection techniques, we used personal interviews for two main reasons. First, it was crucial to determine that the firm had indeed adopted sophisticated capital budgeting techniques for evaluating a large part of their capital budget and that such techniques were properly employed. Second, it was important to ascertain, as precisely as possible, when the adoption took place.

Based on preliminary analysis, 50 firms that were believed to have adopted and consistently applied sophisticated capital budgeting techniques between 1956 and 1976 were initially selected. Forty-one agreed to allow an interview at their corporate headquarters. Six of these firms were used for a pilot study, a match could not be obtained for four of the remaining firms, and one firm did not have enough market return data to be included in the final study. Thus, the final sample of experimental firms was 30.[3]

The interviews were generally conducted with either the vice-president of finance, financial planning manager, corporate controller, or treasurer. Approximately two-thirds of the firms provided their capital budgeting forms or manuals, and 18 of the interviews were tape-recorded. In addition to determining when the adoption of sophisticated capital budgeting techniques took place, the interviews provided an overview of the degree to which sophisticated methods of capital budgeting were used in these firms. Over 90 percent of the firms employed sophisticated capital budgeting selection techniques for evaluating more than half of their capital expenditures.

Control Group of Firms

To obtain control firms, all firms with the same Standard Industrial Code (SIC) on the COMPUSTAT tapes in the year the experimental firm adopted sophisticated capital budgeting techniques were obtained from the tapes. These firms provided pools from which the matching control firm was chosen [Harrison, Tomassini and Dietrich, 1983; Klammer, 1973; Larcker, 1983]. Second, the three firms in each pool which had the closest match on asset size and risk to the experimental firm's asset size and risk were selected as potential matches. Third, a letter was sent to the controller of each potential matching firm, followed a week later by a phone call soliciting information about the types of capital budgeting techniques employed by the firm and if and when changes in those techniques had occurred. The firm using naive techniques

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[3] Additional demographic data (from 1981) on the 30 experimental firms is given below:

Number of Employees			
0–1,000	*1,000–10,000*	*10,000–50,000*	*over 50,000*
4	10	10	6

Total Assets ($)				
0–100 million	*100–500 million*	*500 million- 1 billion*	*1–5 billion*	*over 5 billion*
3	8	7	9	3

TABLE 2

ADOPTION DATES, RELATIVE BETAS, AND RELATIVE ASSET SIZES

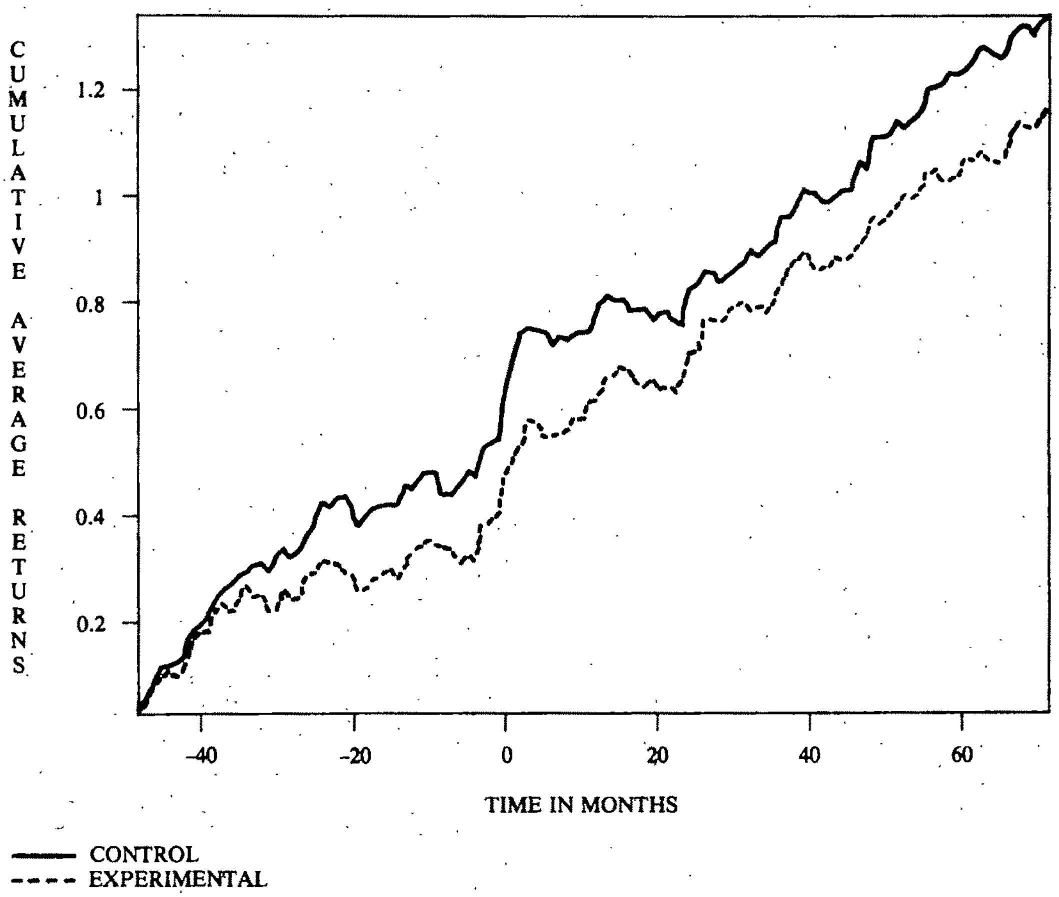
	(1)	(2)	(3)	(4)	(5)
				Asset Ratio	
Matched Pair Number	*Industrial Code*	*Year of Adoption for the Experimental Firms*	*Beta Ratio*	*At Adoption Date*	*1981*
1	2000	1968	1.328	0.986	1.078
2	2065	1975	0.895	3.904	3.699
3	2830	1975	0.585	0.576	1.621
4	2400	1976	0.945	2.202	1.641
5	2830	1968	0.720	1.034	1.232
6	2870	1971	0.688	0.771	0.764
7	2911	1956	0.689	0.802	0.746
8	2911	1962	1.034	0.517	0.701
9	3270	1967	1.714	0.638	0.733
10	3310	1959	0.869	0.929	0.862
11	3310	1967	0.636	1.160	1.032
12	3449	1958	1.434	0.893	0.857
13	3510	1965	0.895	1.979	1.930
14	3520	1961	1.739	1.255	1.522
15	3531	1975	1.733	0.810	0.758
16	3630	1965	0.505	1.141	1.161
17	3651	1976	0.512	0.292	0.187
18	3662	1974	0.682	2.732	3.123
19	3711	1965	1.088	3.971	4.671
20	3721	1969	1.063	0.566	1.091
21	3721	1972	0.424	0.638	0.720
22	3841	1975	0.921	1.059	0.988
23	3861	1971	0.863	2.981	3.676
24	3940	1962	1.484	2.681	0.852
25	4210	1973	0.857	1.700	1.726
26	5311	1965	0.841	6.828	3.235
27	5311	1972	1.441	1.008	1.541
28	5411	1965	0.911	1.534	1.184
29	5411	1973	1.893	4.931	4.587
30	5912	1971	1.943	1.662	1.335

over the entire time frame under study with the closest matches on size and beta was selected as the matching firm. For two firms, the pool of potential matches had to be expanded beyond the initial pool of three before a match could be found.

Table 2 provides an indication of the quality of the matches. Columns three, four, and five consist of ratios of the matching criterion. These ratios were constructed by dividing the experimental firm's variable by the control firm's variable (i.e., the beta or asset size of the experimental firm was divided by the beta or asset size of the control firm). The closer the ratio is to one, the better matched the two firms are on the variable in question. The average betas for the experimental and control portfolios were calculated using the value-weighted market index from the CRSP tapes. These betas were 1.126 for the experimental group and 1.153 for the control group. The difference between the portfolios' betas is small, 0.027, indicating the

FIGURE 1

CUMULATIVE AVERAGE RETURNS: EXPERIMENTAL AND CONTROL



sample was well matched on beta.[4] With regard to asset size, we again appear to have a good match. Further, any individual matching disparities should be offset when the firms are considered as portfolios of experimental and control firms. Additional evidence on the quality of the matched portfolios is provided later in the paper (see Figure 1) where the cumulative average returns of the two portfolios are plotted on the same graph.[5]

V. EXPERIMENTAL DESIGN

To test for a relative shift in firm performance, an interrupted time-series design was constructed. The primary procedure for testing our hypothesis was in accordance with the general argument that the market participants learn of the experimental firms' capital budgeting policy change (i.e., the switch from naive to sophisticated methods) over time as actual application provides the information. We compared the differences in market returns of the experimental and control firms for 48 months prior to the first month of the year in which the experimental firm switched to sophisticated capital budgeting techniques with 48 months of differences after the switch. However, since the impact of sophisticated capital budgeting methods may take time to begin to filter into the marketplace, we followed this basic approach under three alternatives. The first assumed that the market begins learning of the experimental firms' policy switch one year after the switch. Thus, the "after" period was for 48 months beginning after a one-year holdout time frame. The second alternative assumed that the market begins learning of the switch two years after the switch. Thus, the "after" period for this alternative was for 48 months beginning two years after the switch. The time periods for alternatives one and two were selected based on findings by Pettit and Miller [1980] and observations conveyed to us by executives with the experimental firms. The third alternative did not hold out any time period, thereby assuming that market participants begin learning of the policy switch right after it occurs. Thus, the third alternative used as the "after" time period the 48 months from the first month of the year of the switch. Under all three alternatives it is assumed that the market participants are gradually learning of the policy change over time as actual applications of sophisticated capital budgeting techniques are made, but they differ as to when such learning begins—immediately, or one or two years after the switch.[6] A total of 120 months of data was ultimately collected (i.e., four years prior to the switch, plus as much as a two-year holdout period and four years after the holdout period).

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[4] Using the equally weighted market index from the CRSP tapes provides substantially the same results. The difference in the experimental and control portfolios' betas using the equally weighted index is 0.047.

[5] The Brown and Warner [1980] mean adjusted return method was also employed, as described subsequently. Since the mean adjusted return approach (which does not rely on control firms) provides the same conclusions, this provides further evidence of the validity of the matches employed.

The adoption of sophisticated techniques could have an effect on the risk and/or return of the firm's stock. Therefore, before examining market returns it was necessary to examine whether risk changes occurred for either the experimental or control firms. If such a change occurred, any analysis of the difference in market returns between the experimental and control firms would be confounded. Accordingly, tests for shifts in beta were conducted before any analysis of the shifts in returns.

Tests for Shifts in Risk

To test for a shift in beta, an analysis of covariance (ANCOVA) procedure was employed. This procedure involved dividing the overall time period under investigation into two nonoverlapping subperiods. The subperiods were differentiated by the adoption of sophisticated techniques. The sum of squared residuals from a regression with a single independent variable covering both subperiods (the reduced model) was compared with the sum of squared residuals from a regression with two independent variables, one for each of the subperiods (the full model).[7] The ANCOVA test was run on each firm individually and then an additional procedure was used to examine the significance of the results. Since the

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[6] To examine the differences for a more immediate market reaction (i.e., during one month) we performed t-tests on the portfolio differences for each of the 120 months where H_0 is

$$\sum_{j=1}^{30}(R^e_{tj}-R^c_{tj})=0;\ \text{for each } t=-48,\ldots 71.$$

The results, which provide no significant patterns, are available from the authors on request.

[7] Toyoda [1974] investigated the effect on the distribution of the F-statistic when the assumption of equal subperiod variances is violated. The results indicate that the test is well-behaved even under substantial heteroscedasticity for subperiods of the size used in this study.

test statistic for the individual firm ANCOVA comes from an $F(1, n-3)$ distribution, the approach used was to examine the experimental and control portfolios' Fs with a χ^2 goodness-of-fit test. If a significantly larger number than expected of the observed F-statistics falls in the right tail of the $F(1,n-3)$ distribution, that provides evidence of a shift in beta for the total sample of experimental or control firms.

Tests for Shifts in Return

The tests for a shift in average returns were performed on 30 difference series of 120 observations each, one constructed for each matching pair of firms. Let j represent a matched pair, R^e_{tj} be the return in month t on the experimental firm in pair j, and R^c_{tj} be the return on the control firm. The difference, d_{tj}, is:

$$d_{tj}=R^e_{tj}-R^c_{tj},\text{ where } t=-48,\ldots,71,\text{ and } j=1,\ldots,30. \quad (1)$$

Then, the average difference before the switch, d_{b_j}, and the average difference after the switch, d_{a_j}, were constructed for each matched pair by finding the mean of the 48 monthly differences before the switch and the 48 monthly differences after the holdout period, respectively (where $h=0$, $h=12$ months or $h=24$ months, depending on the holdout period). With $t=0$ as the first month of the year in which the experimental firm adopted sophisticated capital budgeting techniques, the average differences for the before and after periods were computed as follows:

$$\bar{d}_{b_j}=\sum_{t=-48}^{-1}\frac{d_{tj}}{48} \quad (2)$$

and

$$\bar{d}_{a_j}=\sum_{t=0+h}^{47+h}\frac{d_{tj}}{48},\text{ where } h=0,\ 12 \text{ or } 24. \quad (3)$$

The result was one sample of 30 average differences before the switch and three such samples for the periods after the switch for each pair of matched firms.

To test for significant change in the average relative performance as a result of the adoption of sophisticated techniques, the following null hypotheses were constructed. The first examines individual pairs before and after the adoption while the second examines the matched portfolios:

H_{0_1}: $\bar{d}_{b_j}\geq\bar{d}_{a_j}$ for each matched pair j, and

H_{0_2}: $\mu_b\geq\mu_a$ for matched portfolios

where

$$\mu_a=\frac{1}{30}\sum_{j=1}^{30}\bar{d}_{a_j}\text{ and} \quad (4)$$

$$\mu_b=\frac{1}{30}\sum_{j=1}^{30}\bar{d}_{b_j}. \quad (5)$$

The first hypothesis, H_{0_1}, was tested using a matched pairs t-test. The second hypothesis, H_{0_2}, was examined employing both the t-test, which assumes normality, and the Mann-Whitney, which only assumes a continuous distribution.

VI. EMPIRICAL RESULTS

Risk Shift

The results of the individual ANCOVA tests for the experimental and control firms are presented in Table 3. As these results indicate, for 15 firms the null hypothesis—H$_0$: $\beta_b=\beta_a$, where β_b = beta for the time frame before the adoption by the experimental firms and β_a = beta after the adoption—was rejected at the 0.05 level for at least one of the three time periods. That is, these firms (six from the experimental group and nine from the control group) experienced a significant shift in beta (at the 0.05 level) in one, two, or three of the before and after time periods examined.

The next step was to determine if the

TABLE 3
TESTS FOR SHIFTS IN SYSTEMATIC RISK

		ANCOVA Results: Experimental Firms							*ANCOVA Results: Control Firms*					
		h = 0 *months*		*h* = 12 *months*		*h* = 24 *months*			*h* = 0 *months*		*h* = 12 *months*		*h* = 24 *months*	
Matched Pair Number	*βb*	*βa*	*F*	*βa*	*F*	*βa*	*F*	*βb*	*βa*	*F*	*βa*	*F*	*βa*	*F*
1	0.85	0.90	0.250	0.91	0.006	0.98	0.010	0.64	0.71	0.130	0.69	0.051	0.68	0.185
2	0.77	0.99	2.689	0.99	3.098	0.98	4.537*	0.86	0.98	1.877	0.98	0.774	0.98	0.194
3	1.21	1.44	2.894	1.45	1.849	1.45	0.360	2.07	1.74	4.796*	1.74	1.392	1.74	0.097
4	1.04	0.91	1.464	0.90	1.040	0.90	1.001	1.10	0.93	1.588	0.94	2.657	0.94	2.657
5	0.85	0.84	0.002	0.84	0.001	0.85	0.436	1.18	1.34	0.578	1.34	0.436	1.36	0.123
6	0.53	0.34	2.190	0.37	0.490	0.42	1.232	0.77	0.33	6.201*	0.28	3.240	0.25	1.489
7	0.84	1.21	0.005	1.23	1.932	1.24	3.062	1.22	1.77	0.533	1.79	5.153*	1.80	6.554*
8	1.23	1.37	0.307	1.37	1.416	1.31	1.369	1.19	1.22	0.036	1.20	0.002	1.23	0.006
9	1.56	0.74	10.240*	0.79	5.924*	0.85	5.290*	0.91	0.67	4.368*	0.67	1.210	0.73	0.723
10	1.26	1.27	0.160	1.26	0.000	1.27	0.130	1.45	1.33	0.068	1.33	0.578	1.34	1.040
11	0.42	0.27	0.109	0.29	1.188	0.30	0.941	0.66	0.74	0.410	0.74	0.292	0.74	0.078
12	1.33	0.97	6.400*	0.97	2.465	0.97	5.523*	0.93	1.24	5.108*	1.25	5.018*	1.24	6.078*
13	1.02	1.02	0.001	0.99	0.232	0.97	0.230	1.14	1.34	0.960	1.32	0.706	1.36	0.152
14	1.60	1.67	0.608	1.68	0.410	1.67	4.537*	0.92	0.72	1.020	0.72	1.166	0.72	0.384
15	1.49	1.47	0.325	1.47	0.008	1.47	0.004	0.86	1.22	2.789	1.22	3.920	1.22	2.372
16	1.39	1.67	1.742	1.68	2.723	1.67	1.988	2.75	2.53	0.706	2.54	0.846	2.56	0.941
17	0.64	0.62	0.063	0.66	0.036	0.63	0.001	1.25	1.04	0.022	1.02	0.723	1.04	0.922
18	1.46	1.29	0.203	1.34	0.432	1.28	0.000	2.14	1.84	0.130	1.92	0.336	1.88	0.250
19	1.49	1.80	2.590	1.81	5.569*	1.81	7.509*	1.37	1.58	4.537*	1.58	3.648	1.58	11.088*
20	1.69	1.45	1.877	1.14	1.188	1.45	1.440	1.59	1.61	0.250	1.61	0.014	1.61	0.000
21	0.61	0.34	5.523*	0.14	3.459	0.20	2.789	1.44	1.42	0.078	1.33	0.109	1.18	1.392
22	0.93	1.31	1.124	1.33	2.098	1.35	1.796	1.01	1.12	0.017	1.13	0.203	1.14	0.068
23	0.88	1.03	1.299	1.01	1.145	0.98	0.003	1.02	0.61	7.896*	0.58	9.986*	0.56	6.452*
24	1.11	1.06	0.091	1.05	0.090	1.02	0.029	0.75	1.04	4.750*	1.03	3.610	1.01	3.764
25	1.02	1.14	0.001	1.14	0.533	1.12	0.397	1.19	1.06	0.129	1.05	0.689	1.04	2.132
26	0.90	0.81	0.026	0.84	0.144	0.86	0.012	1.07	1.22	4.244*	1.26	2.102	1.26	2.465
27	1.34	1.37	0.012	1.36	0.008	1.34	0.048	0.93	0.70	1.563	0.71	1.742	0.71	3.133
28	1.64	1.62	0.036	1.62	0.008	1.60	0.212	1.80	1.62	0.109	1.62	0.260	1.57	0.006
29	1.06	1.17	0.078	1.17	0.281	1.16	1.188	0.56	0.73	0.002	0.72	0.846	0.73	0.846
30	1.22	1.18	0.410	1.19	0.044	1.20	0.044	1.17	1.02	3.133	1.02	0.884	1.02	0.137
Averages	1.113	1.109		1.100		1.111		1.198	1.181		1.177		1.174	
σ^2	0.118	0.157		0.166		0.159		0.219	0.212		0.208		0.208	

* Significant at $\alpha \leq 0.05$

TABLE 4

χ^2 GOODNESS-OF-FIT TEST RESULTS FOR SHIFTS IN SYSTEMATIC RISK

SAMPLE SIZE: $N=30$

Partitions	*0.000–0.102*	*0.103–0.460*	*0.47–1.320*	*1.330–α*	χ^2
Expected	7.5	7.5	7.5	7.5	$\chi^2=0.05=7.81$
Actual					
I. Experimental Firms					
A. $h=0$	10	7	3	10	5.00
B. $h=12$	10	4	6	10	3.60
C. $h=24$	10	5	4	11	4.94
II. Control Firms					
A. $h=0$	6	6	5	13	5.47
B. $h=12$	3	6	10	11	5.47
C. $h=24$	6	8	4	12	4.67

change in beta evidenced by some of the firms in Table 3 was a non-random occurrence. Three of the matched pairs show significant changes for both the experimental and control firms over the time frame. If the change in beta was a result of adopting sophisticated selection techniques, the beta shift should appear only for the experimental firm. Since the change in beta was significant for both firms, the implication is that an industry-wide factor was the cause of the shift. However, the critical question is whether six firms from the experimental group, or nine firms from the control group, out of a sample of 30 pairs of firms, is a significantly large enough number to conclude that there has been a shift in beta for the portfolio as a whole.

The goodness-of-fit tests based on a χ^2 statistic using expected versus observed frequencies in partitions of the F distribution are reported in Table 4. The χ^2 statistic tests the null hypothesis: H_0: $P_A=P_B=P_C=P_D=25$ percent of the sample. P_A, P_B, P_C, and P_D denote the true proportions of the sample which are expected to occur in the A, B, C, and D partitions of the $F(1,93)$ distribution. The A, B, C, and D partitions were calculated by dividing the area under the F-curve into four equal parts (e.g., $A=0.0$ to 0.102 contains 25 percent of the F distribution). The expected or true frequency in each partition is 7.5 (25 percent of 30 matched firms). The actual frequency in each partition is reported in Table 4.

The results of the χ^2 tests reported in the last column of Table 4 indicate that the null hypothesis cannot be rejected at the 0.05 level for either the experimental or the control portfolios in any of the three comparison periods. That is, the observed frequencies were not significantly different from the expected frequencies for an $F(1,93)$ distribution and thus there was not a larger number of F-statistics falling in the right tail than would be expected. These statistics support the conclusion that the adoption of sophisticated capital budgeting selection techniques does not cause a shift in risk. Therefore, the tests for a shift in average returns will not be confounded by a change in beta over the time period of the tests.

TABLE 5

INDIVIDUAL MATCHED PAIR t-TESTS FOR H_{0_1}: $\bar{d}_{b_j} \geq \bar{d}_{a_j}$

Matched Pair Number	$\bar{d}_{b_j}$	$h=0$		$h=12$		$h=24$	
		$\bar{d}_{a_j}$	*p-value*	$\bar{d}_{a_j}$	*p-value*	$\bar{d}_{a_j}$	*p-value*
1	0.00616	0.00779	0.4590	0.00265		−0.01106	
2	0.01050	−0.00365		0.00052		−0.00237	
3	0.04536	−0.04202		−0.01235		−0.00311	
4	−0.02918	−0.00742	0.1122	−0.00479	0.1642	0.00453	0.0633
5	−0.00490	−0.00319	0.4408	−0.00329	0.8893	−0.00048	0.7003
6	0.00468	−0.00418		−0.02039		−0.03225	
7	−0.04112	0.01580	0.0203*	0.02048	0.0217*	0.01639	0.0292*
8	−0.00923	−0.01073		−0.14141		−0.00424	0.6089
9	0.00035	0.01216	0.2066	0.00257	0.8810	0.00106	0.9618
10	0.01061	−0.00520		−0.00288		−0.00535	0.2315
11	0.00147	0.00767	0.3333	0.00418	0.8525	0.00187	0.9780
12	−0.01684	0.01159	0.0732	0.00448	0.2968	0.00866	0.2315
13	0.00261	−0.00771		−0.00490		0.00738	0.7651
14	−0.02521	0.02951	0.0066*	0.02831	0.0163*	0.01588	0.0748
15	−0.01638	−0.01213	0.8554	−0.01101	0.8341	−0.01882	0.9236
16	0.01201	−0.04181		−0.05412		−0.01584	
17	0.01325	−0.00203		−0.01429		−0.00391	
18	0.00324	0.00406	0.4833	0.01269	0.6708	0.01711	0.5022
19	−0.00988	−0.00113	0.2644	−0.00134	0.4874	0.00521	0.2693
20	0.00945	−0.00244		0.00525		−0.00158	
21	−0.06279	0.03834	0.0002*	0.01652	0.0044*	−0.01383	0.0652
22	0.01572	0.00607		−0.00101		0.01372	
23	0.00661	−0.00907		−0.00978		0.00498	
24	−0.00525	0.00846	0.1883	0.00576	0.4883	0.01112	0.2907
25	−0.00041	0.00318	0.4174	−0.00411	0.8283	−0.00083	
26	−0.01063	0.00385	0.1203	0.00536	0.1860	0.00251	0.2892
27	0.01033	0.01211	0.4619	0.01589	0.7572	0.01908	0.6161
28	0.00451	0.01325	0.3824	0.00997	0.8458	−0.01001	
29	−0.02338	−0.00280	0.1280	−0.00250	0.2531	0.00452	0.1233
30	0.01007	−0.00945		−0.01012		−0.02190	

* Significant @ $p \leq 0.05$

Note: Blanks for p-values indicate that $\bar{d}_{b_j} > \bar{d}_{a_j}$.

Return Shifts

Table 5 provides results of individual t-tests on each matched pair of firms for holdout periods of $h=0$, $h=12$, and $h=24$ months. The hypothesis examined by the tests in Table 5 is H_{0_1}: $\bar{d}_{b_j} \geq \bar{d}_{a_j}$. Three matched pairs in the $h=0$ and $h=12$ groups and one matched pair in the $h=24$ group show a significant difference in their average relative performance between the before and after periods. The only matched pair to show a sustained significant improvement over the entire time period tested was number seven. These results do not support the theoretical argument of greater firm performance for firms adopting sophisticated capital budgeting techniques. However, further tests over the entire portfolio of matched firms are necessary.

Figure 1 is a plot of the cumulative average returns for the experimental and control portfolios over the 120-month test period. The plot indicates that the performance of the two portfolios was similar over months −48 to about −30, but during the two-and-a-half years prior to the adoption of sophisticated techniques by the experimental firms, months

Table 6

Test of Shifts in Average Relative Performance for the Portfolio of Matching Firms

$H_{0_2}: \mu_b \geq \mu_a$

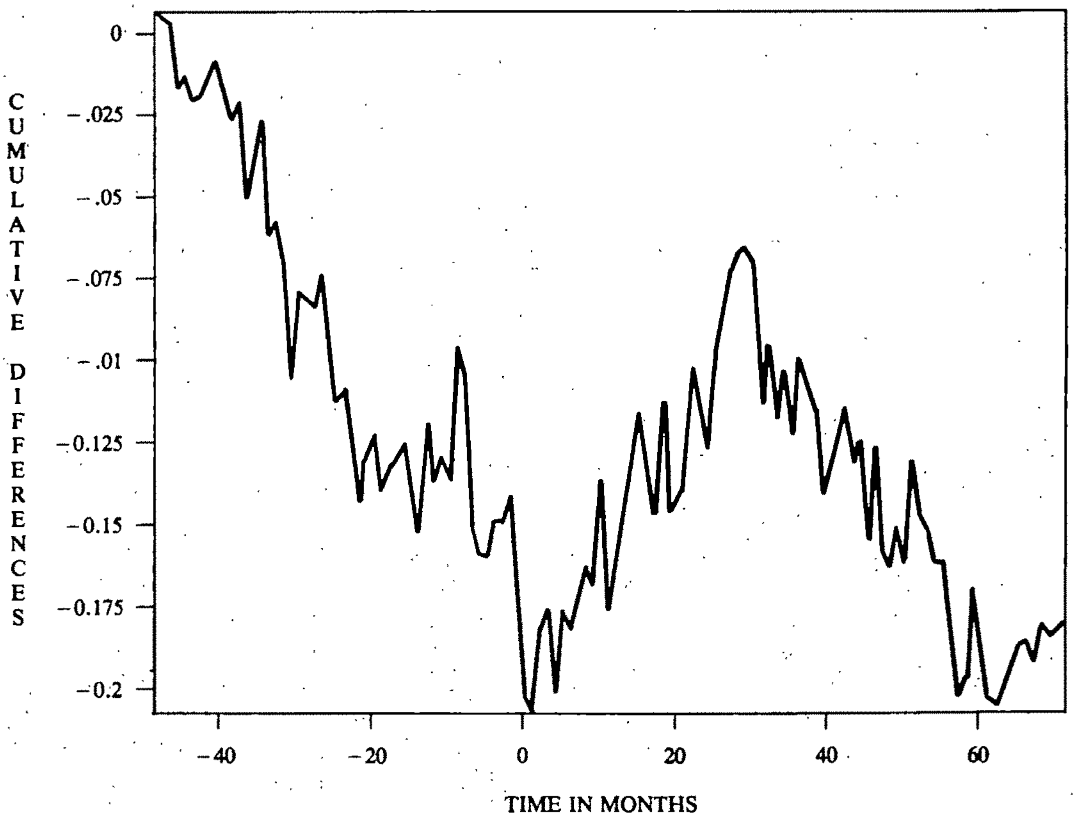
	$h=0$	$h=12$	$h=24$
μ_b	−0.00294	−0.00294	−0.00294
μ_a	0.00029	−0.00121	−0.00163
σ_b	0.020	0.020	0.020
σ_a	0.016	0.015	0.012
t-statistic	−0.689	−0.380	−0.307
p-value	0.247	0.353	0.380
U-statistic	888.5	917.5	927.5
p-value	0.356	0.456	0.492
Improvement in relative performance $\frac{\mu_a-\mu_b}{\mu_b}$	110.0%	58.6%	44.6%

−30 to 0, the performance of the experimental portfolio began to decline relative to the performance of the control portfolio. That is, the vertical distance between the two curves, $\bar{d}_t$, increased. After the first month of the adoption year, month $t=0$, the experimental firms were able to halt the relative decline in their performance, but they were not able, at least in months 0 to 71, to make up the distance they lost during the two-and-a-half previous years. The tests on $\bar{d}_t$ for shifts in market returns for the entire portfolio of matched firms reported in Table 6 confirm the visual analysis of Figure 1. For the $h=0$, $h=12$, and $h=24$ month holdout periods, the differential mean returns $(\mu_a-\mu_b)$ decreased slightly. This is illustrated by noting that μ_a is 0.00323 larger at $h=0$, 0.00173 larger when 12 months were omitted, and 0.00131 larger when 24 months were omitted. While in each case the average relative performance of the portfolio of experimental firms improved slightly after adopting sophisticated capital budgeting techniques, the numbers are small relative to the standard deviation and the tests were not statistically significant. Further, it is worth emphasizing that the smaller the holdout period, the greater the improvement in the performance of the experimental firms relative to the control firms. Although it has been argued that a capital budgeting policy change is recognized by the market participants over time, it would appear that the dissemination of information begins around the beginning of the year of the switch.

The results reported in Table 6 indicate that the difference in returns between the experimental and control firms was reduced in the time period after the capital budgeting policy switch. However, statistically speaking, the reduction was not significant. Although the control firms outperformed the experimental firms over both the "before" and "after" time periods, the difference was reduced after the switch. Accordingly, we decided to examine further the average differences between experimental and control firms for the entire 120-month period. A plot of the cumulative average differences in returns for the portfolio of firms over the 120 months is shown in Figure 2. This graph confirms that the cumulative negative difference between the returns of the experimental and control firms grew to be large before the adoption date, but began to narrow by the second month of the year the experimental firms adopted so-

FIGURE 2

CUMULATIVE AVERAGE DIFFERENCES



phisticated capital budgeting methods. It appears that the time periods where the greatest changes took place were somewhere between the −28th and second months (when relative return differences increased), and the third and 33rd months (when return differences decreased). Accordingly, using the same method discussed earlier, the 30 months up to and including $t=2$ and the 30 months after $t=2$ (the second month of the adoption year) were examined for shifts in risk and returns.

Not surprisingly, in light of Figure 2, we found that the difference in average returns had a significant p-value of 0.03 for the portfolio of firms when comparing the two 30-month time periods. That is, the returns of the experimental firms had moved significantly closer to the control firms in the "after" time period compared to the "before" period, thereby statistically confirming the plot in Figure 2. This change in the distribution of average returns was not accompanied by a statistically significant change in risk (beta) for the experimental or control firms over the two time periods.[8] Therefore, it would appear that some shift in the experimental firm's returns relative to the control firm's returns did take place beginning a few months after the capital budgeting policy change.

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[8] The p-value for the two-sample t-test for a change in means between months −28 to 2 and 3 to 30 is 0.0393. The two X^2 values to test for a shift in beta over the same time period are 4.40 for the experimental portfolio and 5.47 for the control portfolio.

To examine our findings in a manner that does not depend on the matching process, we also employed the mean adjusted returns procedure [Brown and Warner, 1980] which uses a firm as its own control. This procedure computes the abnormal performance measure for a given security in a particular month by taking the difference between the security's estimated average (mean) return over a specified period and its realized return for the month in question. This difference, which is standardized by the estimated standard deviation of the security's return, is averaged over the number of months being examined on a security by security basis.

In our study, the estimated average return for each security was estimated over months -48 through -7. The approach can be algebraically expressed as follows:

$$\text{Estimated Average (mean) Return} = \hat{K}_j = \sum_{t=-48}^{-7} \frac{R_{tj}}{42}, \tag{6}$$

where R_{tj} is the return of the j^{th} experimental firm in the t^{th} month,

$$\text{Estimated Standard Deviation of Security's Return} = \hat{\sigma}(R_j) = \frac{1}{41} \sum_{t=-48}^{-7} (R_{tj} - \hat{K}_j)^2 \tag{7}$$

$$\text{Mean Adjusted Return in Month } t \text{ for Firm } j = A_{tj} = \frac{R_{tj} - \hat{K}_j}{\hat{\sigma}(R_j)}, \text{ for each } t \text{ from } -6 \text{ to } 71. \tag{8}$$

Similar to our earlier tests to determine if significant returns were evident around and after the adoption of sophisticated selection techniques, the portfolio monthly mean adjusted returns for both the control and experimental firms were averaged over months -6 to 29 and tested to see if they were significantly different from zero. The null hypothesis for the portfolio t-tests over this 36-month period is as follows:

$$H_{0_3}: \bar{A} < 0, \text{ where } \bar{A} = \frac{1}{36} \sum_{t=-6}^{29} A_t.$$

For the experimental firms the t-statistic to test for a significant difference in the period $t = -6$ to $t = 29$ compared to the base time period ($t = -48$ to $t = -7$) was 1.096 (p-value of 0.14). For the control firms the t-statistic was 0.171 (p-value of 0.43). Thus, using the mean adjusted return method, there is an indication of higher returns for the switching firms around and in the two-and-a-half years after $t = 0$, but it is not statistically significant. For the control firms there is little evidence of increased mean adjusted returns during the same time period.

Figure 3 (which is a plot of the cumulative mean adjusted returns) provides additional evidence for the analysis presented earlier on the experimental firms.[9] Note that before the adoption of sophisticated capital budgeting techniques, the standardized excess returns are negative, while they become positive in the first four months of the year of the switch to sophisticated techniques. These results indicate, as did the earlier analysis, that the adoption of sophisticated selection techniques had a short-run impact on the adopting firm's returns. However, over the longer run we see that the cumulative mean adjusted returns drifted down-

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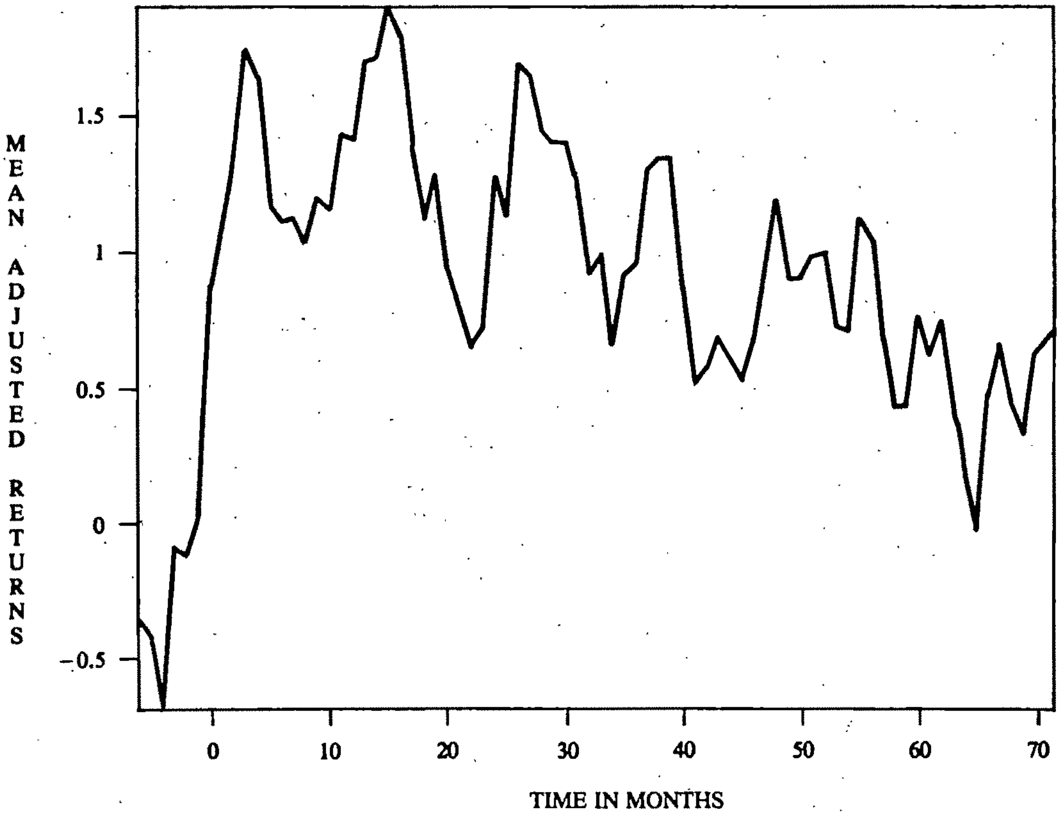
[9] We also performed t-tests on the mean adjusted returns for each of the months from $t = -6$ to $t = 71$. These results provided no significant patterns and are available from the authors on request.

FIGURE 3
CUMULATIVE MEAN ADJUSTED RETURNS FOR EXPERIMENTAL FIRMS



ward. When this information is coupled with the known inferior performances of the experimental firms relative to the control firms (discussed earlier), the similarity of the results from the two approaches becomes even more striking. Using either method leads to the conclusion that the adoption of sophisticated capital budgeting techniques, contrary to financial economic theory, did not lead to superior returns.

VII. CONCLUDING DISCUSSION

Klammer [1973] concluded that the mere adoption of various analytical tools for capital budgeting was not sufficient to bring about superior operating performance. Christy [1966] showed that the earnings per share trends were not significantly different for companies using different kinds of standards for selecting capital projects. In contrast, Kim [1975, 1982] found that firms which used more sophisticated methods for selecting capital projects tended to have higher operating rates of return and higher earnings per share. The results of this study provide a more definitive conclusion. An examination of the 48 months before the switch with three different 48-month periods after the switch indicates no significant improvements in the relative market performance of the firms adopting sophisticated selection techniques. However, it is obvious from Figures 1, 2, and 3 and the statistical tests conducted around and in the two-and-a-half years subsequent to the policy switch that the relative return was changing for the experimental firms near the point of the policy switch. Thus, while we found no long-run effects on relative market returns for adopting firms, our results do suggest, contrary to the gradual dissemination hypothesis, that there is a short-run positive effect when firms adopt sophisticated capital budgeting selection procedures.

Although our study controlled for risk, size, and industry effects, there are several other factors which may vitiate the improvement of firm performance after a switch from naive to sophisticated capital budgeting selection techniques. These factors may have affected the analyses and as such represent limitations to our work. The first of these factors is what we term an *economic stress hypothesis*. Implementation of sophisticated capital budgeting methods may be one of many means for coping with acute resource scarcity (i.e., economic stress). In times of economic stress, firms do some "belt tightening" by instituting cost reduction procedures, tighter and more careful budgeting, and so forth. The adoption of new criteria for capital budgeting could be one of these belt tightening procedures. Our analysis indicated a decline in the returns of the experimental firms compared to the control firms before they revised their capital budgeting policy. Additional support for this position is provided by the fact that approximately 60 percent of the experimental firms implemented sophisticated capital budgeting techniques in a period when there was a reduction in the gross level of investment for capital expenditures. Future studies might control for this economic stress phenomenon by dividing firms into resource-abundant and resource-scarce groups [Pfeffer & Salancik, 1974; and Pike, 1983].

A second factor which may affect the results is the degree of environmental uncertainty, beyond that related to industry effects, facing a firm. The results of the Christy [1966] and Schall and Sundem [1980] studies point toward the hypothesis that firms will experience more benefits from using risk-adjusted discounted cash flow techniques for capital budgeting the more stable (i.e., less uncertain) their environment. For example, Schall and Sundem [1980] found that the use of sophisticated techniques declined with increases in environmental undertainty, where beta measured uncertainty. Future work in this area might control for the environmental dynamism facing a firm in trying to evaluate the effects of a policy switch related to capital budgeting techniques. There may also be an interactive effect between this variable and the resource scarcity/abundance variable.

A third factor that may affect the improvement in firm performance is the company's reward structure. Companies that reward their employees on the basis of long-term incentive plans may experience more benefits from sophisticated selection techniques than companies that reward using a short-term reward plan. Addressing a different but related issue, Larcker [1983] found that firms employing long-term incentive plans were more prone toward capital expenditures than those firms not employing such plans.

Another limitation to our study concerns the sample of firms. The sample size of only 30 pairs of firms limits the power of our statistical tests. Nevertheless, research on many managerial accounting and finance issues (such as this one) requires careful analysis of individual firms even at the expense of sample size and reduced power in statistical tests [Kaplan, 1983, 1984].

Finally, our sample was chosen in a nonrandom fashion, especially in terms of geographical location of the firms' headquarters. Although we know of no reason to assume the results were biased due to this fact, our conclusions should be interpreted with care in reference to firms outside the study.

The above points notwithstanding, our results present a clearly discernible pattern. We conclude that the adoption of sophisticated capital budgeting selection techniques, in and of itself, does not result in superior market performance. However, we did find some suggestion of short-run improvement in the returns of adopting firms around and during the two-and-a-half years beginning with the year firms adopt sophisticated capital budgeting selection techniques. Finally, it appears that the adoption of sophisticated selection techniques may be one of many policies firms pursue in the face of economic stress. This switch in capital budgeting selection procedures may, in combination with other policies, bring about economic recovery.

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THE ACCOUNTING REVIEW
Vol. LX, No. 4
October 1985

Monetary Compensation and Nontaxable Employee Benefits: An Analytical Perspective

Robert Halperin and Joseph Tzur

ABSTRACT: This paper analyzes the payment of monetary compensation (salary) and nontaxable benefits and develops an expansion path for the optimal combination of salary and benefits. The results explain why 1) the employer has an incentive to pay nontaxable benefits instead of salary, 2) benefits such as health insurance are given to lowly as well as highly paid employees while perquisites become a more favored form of compensation as employees' incomes increase, 3) an employee at or near the minimum wage for his or her occupation may receive increases in compensation in the form of increased nontaxable benefits, 4) a broad class of middle management employees are all paid the maximum legal benefits for their job classification, and 5) the employer may authorize the payment of possibly nondeductible benefits to highly compensated executives.

I. Introduction

One of the features of the Internal Revenue Code is that certain forms of compensation, although tax-deductible to the employer, are not taxable to employees. Nontaxable benefits of this type include employer payments for employee health and life insurance premiums, contributions to employee retirement and legal service funds, and payment of employee educational expenses. Although several of these benefits have been nontaxable for a number of years, legal plan and educational expense payments are relatively new additions to this category. In addition, the Revenue Act of 1978, by adding Section 125(d) to the Code, assured that all of these benefits would remain nontaxable to employees on the condition that they were offered as part of a "cafeteria plan" which did not discriminate in favor of highly-compensated employees.[1] Accordingly, nontaxable benefits have become increasingly available to employees with the passage of time.

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[1] White [1983] contains a table (p. 540) which describes these benefits as well as their statutory limitations and effective dates. The article also contains a good description of cafeteria plans.

This research was conducted when both authors were Assistant Professors of Accounting, The Wharton School, University of Pennsylvania. We would like to thank the participants at the accounting department workshops at The Wharton School, Baruch College, and New York University for their helpful comments concerning earlier drafts of this paper. In this regard, we would like to especially thank Nick Gonedes, Jevons Lee, Josh Ronen and Ro Verrecchia. We would also like to acknowledge the helpful comments of the editor and two anonymous reviewers.

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Manuscript received November 1983.
Revisions received July and December 1984.
Accepted January 1985.

A second type of benefit which is nontaxable to the employee while being tax-deductible to the employer is commonly referred to as "perquisites." Perquisites include such items as an expense account, use of a company car, and a plush office. While it is acknowledged that the employer may derive some benefit from these perquisites, it is assumed that the employee also derives some utility from them. Based on this assumption, the employer may authorize such perquisites as part of the employee's compensation package. These perquisites can be either definitely deductible or questionable from a tax viewpoint. The extent to which employers will authorize questionable perquisites depends upon the degree of monitoring by the Internal Revenue Service (IRS) and the consequences to the employer of being caught by the IRS.[2]

From the viewpoint of both employer and employee, both of these types of nontaxable benefits are substitutes for monetary compensation to some degree. However, they have a tax advantage over monetary compensation since monetary compensation is taxable to the employee. Accordingly, there exists an incentive for employers to pay and for employees to receive nontaxable benefits in lieu of salary.

Since payments of nontaxable benefits in lieu of salary can benefit both employers and employees, articles in the popular and professional literature (e.g., Lawler [1976]; Mullin [1972]; Werther and Cone [1979]) have argued for the payment of nontaxtable benefits as a way to increase employee morale, while at the same time reducing overall compensation expenses. In this paper, we analyze nontaxable compensation within the context of the employer-employee relationship. The analysis develops an expansion path for the optimal combination of monetary compensation and nontaxable benefits.

Our analysis will help explain why:

1) The employer has an incentive to pay nontaxable benefits instead of salary.
2) Health insurance benefits are given to lowly as well as highly paid employees.
3) Perquisites become a more favored form of compensation as employees' incomes increase.
4) An employee at or near the minimum wage for his or her occupation may receive increases in compensation in the form of increased nontaxable benefits.
5) A broad class of middle management employees are paid the maximum legal benefits for their job classification.
6) The employer may authorize the payment of questionable perquisites to highly compensated executives.

Our model formulation draws from two results that are well established in the economics literature. The first is that workers view nontaxable benefits as substitutes for wages. Studies such as Ehrenberg [1980] have measured market equilibrium tradeoffs among various components of compensation. Since these studies are market-oriented, they develop implicit price curves for nonwage benefits such as pensions [Whiting, 1979]. Other studies have examined employee preferences for wage and nonwage benefits explicitly. Studies of this type include White [1983] who examined employee preferences for benefits offered in a cafeteria plan and Woodbury [1983] who examined the elasticity of substitution between wages and benefits.

The second result links the payment of nonwage benefits to their tax advantages.

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[2] The employee may also consume unauthorized perquisites, whether or not they are deductible. This issue is not analyzed in this study.

Nonwage benefits which have been examined in this context include health insurance [Feldstein, 1973], pensions [Cymrot, 1980], stock options [Miller and Scholes, 1980] and perquisites [Halperin and Johnson, 1983].

Although our study is related to the literature in labor economics and employee benefits, the focus of our study is quite different. We explicitly consider such institutional constraints as minimum wage laws and maximum benefits allowed by law in the analytical development of our expansion path. The inclusion of these constraints allows us to draw conclusions concerning the amount of wages and the types of nontaxable benefits paid to employees across broad classes of income.

The remainder of the paper is organized as follows. In Section II we develop the general model in the absence of minimum wage or IRS monitoring constraints. In Section III we add a minimum wage constraint and in Section IV we add an IRS monitoring constraint. Section V summarizes our results and presents suggestions for further research.

II. THE MODEL

In this section, we develop the model of the compensation package to be given to the employee or worker. We assume that the worker has already performed his or her task and the employer must now pay the worker the contracted fee for this task. The fee is payable either entirely in money, M^*, or in any combination of money and nontaxable benefits which provides the worker with the same level of utility as the receipt of m^* alone, where $m^* \equiv M^*(1-t_w)$ and t_w is the worker's tax rate. The employer's objective is to find the combination of money and nontaxable benefits which minimizes total compensation expense while maintaining the worker on the same utility level that the worker would have received if the worker had received m^* and no benefits. Mathematically, the employer's problem may be stated as

$$\underset{M,\beta_1,\beta_2,\ldots,\beta_n}{\text{Minimize}} \quad (1-t_e)(M+b) \quad (1)$$

$$\text{subject to } G(m, \beta_1, \beta_2, \ldots, \beta_n) = G(m^*, 0, 0, \ldots, 0)$$

where

t_e is the tax rate for the employer;

M is the gross money wage paid to the worker;

β_i is the cost of nontaxable benefit i paid to the worker, $i=1, 2, \ldots, n$;

b is $\sum_{i=1}^{n} \beta_i$;

G is the worker's utility function for his or her endowment of money and benefits;

m is $M(1-t_w)$ where t_w is the worker's tax rate; and

m^* is the agreed-upon after-tax money wage which the worker must receive if he or she receives money, alone.

We assume that any benefits which the worker receives from the employer are consumed personally by the worker. Accordingly, the worker may use m to "buy" more benefits but not the opposite. This assumption reflects the reality that most employee benefits are not transferable. We further assume that money and benefits are both normal goods; if m^* increases, the new utility-maximizing combination of money and benefits will contain both more money and more benefits than the old utility-maximizing combination.

The solution to this problem is for the employer to trade away m in exchange for any β_i as long as the marginal rate of substitution of m for that particular β_i, $MRS(m,\beta_i)$, is greater than $1-t_w$. The worker's compensation package will not contain any β_i for which $MRS(m,\beta_i) < 1-t_w$ at $\beta_i=0$. In addition, $MRS(\beta_i,\beta_j) = 1$ for all benefits contained in the compensation package.

Note that when m^* increases, it becomes increasingly likely that the condition that $MRS(m,\beta_i) > 1-t_w$ will be satisfied for all β_i. Accordingly, as m^* increases, two things will happen. First, the amount of each β_i will increase. Second, the number of different benefits included in the employee's compensation contract will increase. In general, a specific β_i will be included in the worker's compensation package if the worker would purchase it at a price no smaller than $\beta_i(1-t_w)$, using after-tax wages. One reason for this, shown by the solution to equation (1), is that the employer can appropriate the tax savings associated with the nontaxability of the benefit to the worker. Another reason is that β_i, the cost of benefit i to the employer, may be less than the cost of benefit i if the worker purchased it individually. Such is the case, for example, with health insurance, group life insurance, and certain perquisites such as free airline tickets for employees of airlines. Benefits would, therefore, enter the worker's compensation package in the same order that they are purchased individually by the worker as their prices are proportionately decreased. Thus, one might expect to see the compensation packages of lowly paid employees containing only those benefits such as health insurance which have a high $MRS(m,\beta_i)$ even at low levels of income. As income increases somewhat, benefits such as pensions become included. As income increases further, $MRS(m,\beta_i)$ becomes greater than $1-t_w$ for some perquisites such as an expense account and these are included. Finally, at high income levels, one observes several perquisites included in the employee's compensation package as well as benefits such as health insurance, pension, life insurance, and legal benefits.

It is interesting to note that these results are independent of income taxation on the employer. They only depend upon the fact that b is not taxed to the *worker*. Accordingly, one might expect that, other things being equal, not-for-profit organizations have as much of an incentive to offer b to their employees as do taxable entities. It is not surprising, therefore, that employees of not-for-profit organizations such as policemen, firemen, school teachers, and nurses receive nontaxable benefits as part of their compensation package.

On the other hand, the solution of the employer's problem is affected by t_w. If t_w increases and the employer wants to keep the worker on a constant level of utility, the employer will substitute more b for m.[3] This result is consistent with results in the public economics literature which state that if the tax on one factor of production increases, the cost-minimizing strategy causes a substitution of the lower-taxed factor for the higher-taxed one. (For example, see Atkinson and Stiglitz [1980].) These results support similar conclusions reached in the professional literature [Mullin, 1972; Lawler, 1976; and Werther and Cone, 1979]. They also give rise to the hypothesis that employee tax rates and the level of nontaxable benefits paid are positively correlated when we compare two populations of employees with the same net salaries.

So far, the analysis has proceeded under the implicit assumption that there exist no constraints on either m or β. In reality, minimum wage laws put a lower bound on m, while the tax laws them-

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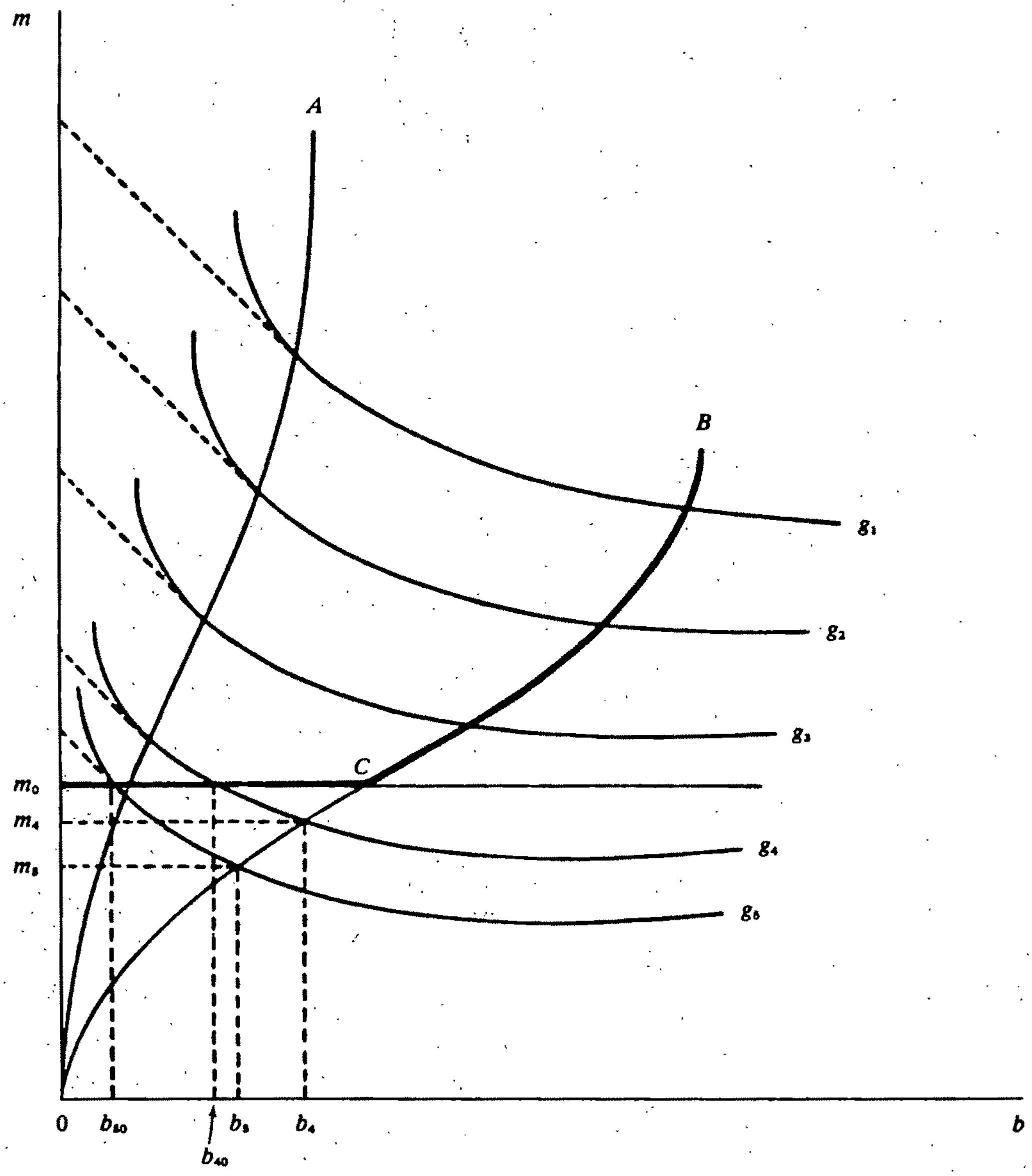
[3] We assume that, for the purpose of this part and succeeding parts of the analysis, prices of the goods and services that the employee can buy with m are exogenous to the model.

FIGURE 1
IMPOSITION OF MINIMUM WAGE



selves and their administration by the IRS put an upper bound on β.[4] In Section III, a minimum wage constraint is added to the model. In Section IV, we introduce the notion of a maximum amount of definitely deductible benefits which can be offered and we allow for IRS monitoring of this maximum amount.

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[4] In reality, an upper bound on m exists as well through Reg. Sec. 1.162-7 and court cases thereunder dealing with unreasonable compensation. These cases generally involve an owner-employee of a corporation who tries to "disguise" a dividend by calling it compensation. They rarely involve non-owner employees who receive a compensation package through arms-length negotiation. Since our model assumes that the worker is a non-owner

III. THE IMPOSITION OF A MINIMUM WAGE

The effects of the imposition of a minimum wage on the worker's compensation package can be seen by observing Figure 1. It shows indifference curves g_1 through g_5, curved line OA which intersects these indifference curves where their slopes are -1, and curved line OB which intersects the indifference curves where their slopes are $-(1-t_w)$.

Assume that the government imposes a minimum wage M_o on the employer, and, as a result, the worker receives no smaller after-tax wage than m_o. Also assume that the employer is obligated to put the worker on g_4. In the absence of any minimum wage, the worker would receive m_4 and b_4 (i.e., the level of m and b where g_4 intersects OB). The minimum wage law, however, requires the worker to receive at least m_o. Given this constraint, the worker will receive m_o and b_{4o}. If the employer were obligated to put the worker on g_5, the worker would receive m_5 and b_5, assuming no minimum wage law and a constant t_w. Given the minimum wage law, the worker will receive m_o and b_{5o}. For levels of g which intersect OB at a level of m above m_o, the unconstrained solution applies.

This analysis shows that if an employee is currently being paid the minimum wage and the employer wants to give the employee a raise, the employer will increase b while leaving m at m_o. For example, if the worker is currently on g_5 and the employer wants to raise him or her to g_4, the employer will raise b from b_{50} to b_{40} while leaving m at m_o. This is true for any level of g for which m_o is a binding constraint. It is not until the constraint is no longer binding that the worker will receive a raise in the form of increased m as well as increased b.

If g is the same for all employees, line m_oCB describes the optimal combination of m and b to be received by all employees in the presence of a minimum wage. In this regard, m_oCB may be viewed as an expansion path of m and b. The implication of this expansion path is that in industries which are directly affected by the minimum wage laws, one should expect to find a number of employees who are all paid the minimum wage but who receive different levels of benefits. For employees who are above the minimum wage, one might expect to see employees who receive higher wages also receiving more benefits.

Although the graphical analysis of Figure 1 captured the trade-off between wages and benefits in general in the presence of minimum wage laws, it did not take into consideration the types of benefits which would be offered to employees affected by these laws. Our analysis in Section II showed that the first benefits to be included in the employee's compensation package are those for which the employee's $MRS(m,\beta_i)$ is highest. For those employees at the minimum wage, this benefit might be health insurance. One would not expect to see employees at this level of income receiving benefits such as pension plan payments or perquisites since, for these benefits, $MRS(m,\beta_i)$ is probably less than $1-t_w$.

IV. DEDUCTIBLE BENEFITS AND IRS MONITORING

In this part, we refine the analysis to include auditing or monitoring by the IRS. We assume that, for each β_i, there is a maximum nontaxable amount, β_{Li}, which can be paid to the worker and be

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and the optimal fee was reached as a result of arms-length negotiations between the employer and the worker, the possibility that the IRS would assert that the agent has received unreasonable compensation has been ignored.

definitely deductible under the tax law. (An example of such a constraint may be found in the case of defined contribution pension plans. According to Internal Revenue Code Section 415(c), the maximum annual deduction for employer payments to noncontributory plans of this type is the lesser of $30,000 or 25 percent of compensation minus any additions to the account from forfeitures.) If the worker receives $\beta_i > \beta_{Li}$, the IRS will find $\beta_i - \beta_{Li}$ with constant probability δ_i.[5] The tax on $\beta_i - \beta_{Li}$ will be assessed against the employer at a tax rate of t_e. Throughout this analysis, we assume that the employer is risk-neutral and that the worker is to be kept at a constant level of utility.

Under these assumptions, the employer wants to

$$\underset{M,\beta_1,\beta_2,\ldots,\beta_n}{\text{Minimize}} \quad (1-t_e)\left[M+\sum_{i=1}^{n}\beta_i\right]+t_e\sum_{i=1}^{n} max\,[\delta_i(\beta_i-\beta_{Li}),0] \tag{2}$$

subject to $G(m,\beta_1,\beta_2,\ldots,\beta_n)=G(m^*,0,0,\ldots,0)$.

The solution to equation (2), found in the Appendix, is to trade away m for β_i until

$$MRS(m,\beta_i)=\frac{1-t_w}{1-t_e}1-t_e(1-\delta_i) \tag{3}$$

and to trade away β_i for β_j or *vice versa* until

$$MRS(\beta_i,\beta_j)=\frac{1-t_e(1-\delta_j)}{1-t_e(1-\delta_i)} \tag{4}$$

for those $\beta_i,\beta_j \neq 0$. When $(\beta_i,\beta_j) \leq (\beta_{Li},\beta_{Lj})$, equation (4) is the same as equation (1).

A graphical representation of the solution can be found in Figure 2, assuming the existence of one benefit.

Figure 2 shows various utility maps with lines *OA*, *OC*, and *OB* emanating from the origin. Lines *OA* and *OB* intersect the *g* curves where their slopes are -1 and $-(1-t_w)$, respectively. Line *OC* intersects all of the *g* curves where their slopes are $-((1-t_w)/(1-t_e))(1-t_e(1-\delta))$ and represents the optimal combination of m and b when $b > b_L$.

Consider the segment of b_L denoted *DE*. For g_2 which passes through *DE*, the worker would receive the level of m and b where *OB* intersects g_2 or m_{21} and b_{21} if all b were definitely deductible. However, since $b_{21} > b_L$, the employer has an incentive to move the worker back towards point *F*. Moving from right to left along g_2, once g_2 intersects *DE*, $max[\delta(b-b_L),0]=0$. Accordingly, no deductions will be disallowed if the worker is paid b_L and m_{22}. From the employer's viewpoint, paying b_L and m_{22} is superior to paying the amounts of b and m represented by point *F*.

For g_1 which intersects b_L above point *F*, the existence of b_L and δ will cause the employer to move the worker from point *G* where the optimal combination of m and b is m_{11} and b_{11} to point *H* where m is m_{12} and b is b_{12}. Note that although the existence of δ reduces the optimal amount of b paid, the optimal amount is still greater than b_L. For g_4 which intersects *OB* before it intersects b_L, the employer will optimally pay m_4 and b_4. In the region of *OB* represented by *OD*, the existence

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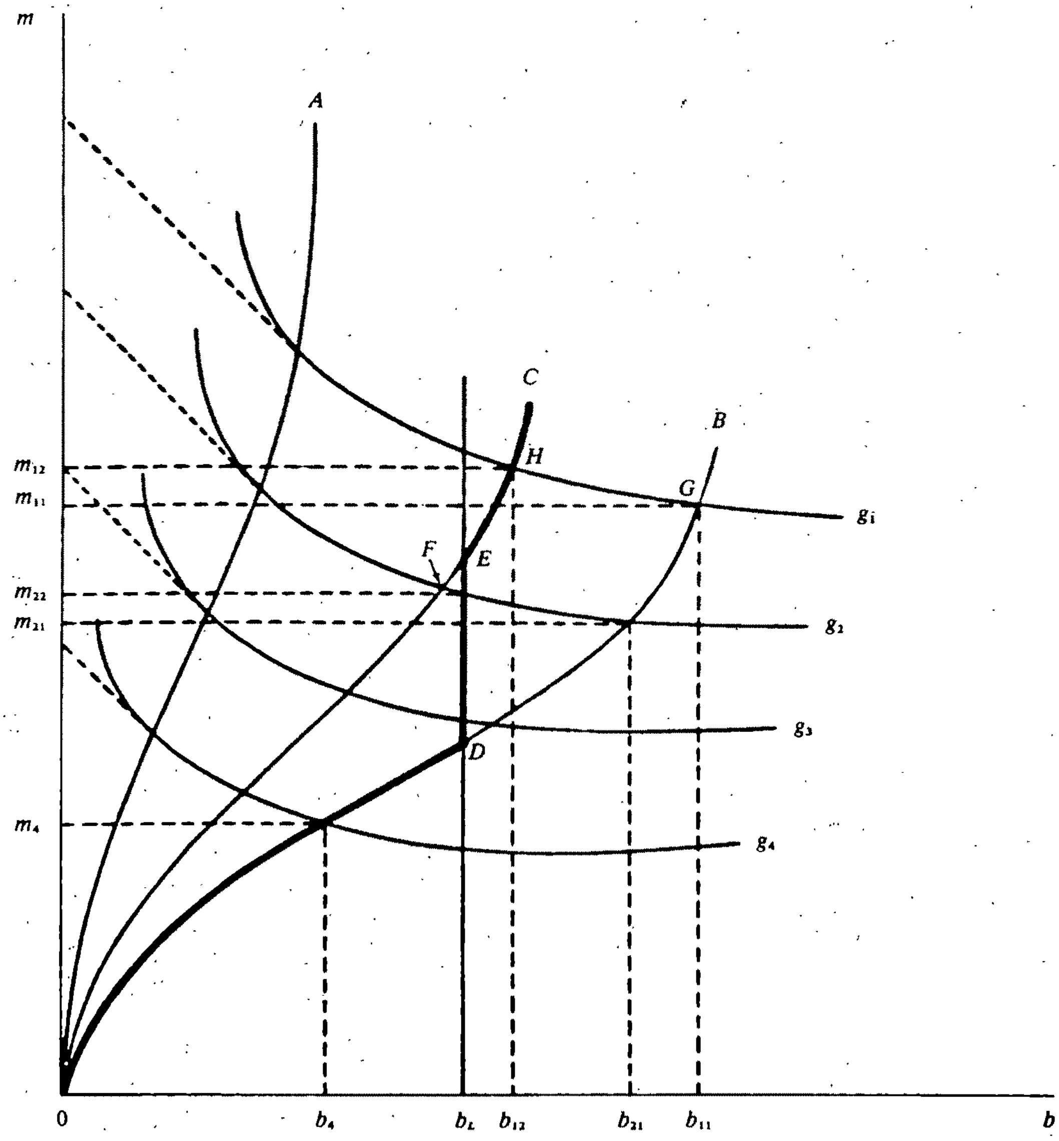
[5] The analysis assumes that δ_i is independent of δ_j for all i and j. While we acknowledge that this assumption may not be in accordance with reality, it facilitates the analysis and does not adversely affect the point we wish to make concerning ordering of benefits by probability of detection.

FIGURE 2
LEGAL BENEFITS AND IRS MONITORING



of both δ and b_L is essentially irrelevant.

The line segments *ODEC* represent a three-region expansion path of the optimal combinations of all m and b assuming constant δ, b_L, t_w, and t_e. The first region, *OD*, contains the lowest-paid employees whose benefits are less than b_L and may represent the condition of many unskilled workers. The second region, *DE*, contains those employees all of whom receive the same b but different levels of m. This region may be representative of lower and middle management employees. The region *EC* contains those highly paid executives for whom it is in the employer's interest to authorize benefits that may not be deductible. The implications of these results are that within a firm, one may expect to find the low-paid employees receiving less than the maximum deductible benefits, a middle group of employees who receive all the benefits that definitely are deductible, and a number of highly paid executives who receive some benefits that may be judged not to be deductible.

The number of employees who receive the maximum definitely deductible benefits, assuming that b_L remains constant, is determined by the values of δ, t_w, and t_e in the equation

$$MRS(m,b) = \frac{1-t_w}{1-t_e}\,(1-t_e(1-\delta)). \quad (5)$$

The employer will not pay possibly nondeductible benefits (i.e., line segment DE will be infinitely long) when the right side of equation (5) is greater than 1. $MRS(m,b)$ is never greater than 1, since the worker never has to give up more than \$1 of m to receive \$1 of b. Accordingly, when the right side of equation (5) is greater than 1, the optimal solution for the employer is to pay b_L and some amount of m which gives the worker the agreed-upon utility and let the worker trade away m for any remaining desired b. This implies that b will never exceed b_L as long as

$$\delta > \frac{t_w(1-t_e)}{t_e(1-t_w)}. \quad (6)$$

For any given level of δ, inequality (6) becomes less likely to be satisfied as t_w increases relative to t_e. This result has some interesting implications for IRS auditing policy. Presumably, the IRS is interested in having an employer deduct only legal benefits. Given the progressive tax rate structure which exists in the U.S., expression (6) says that the IRS should spend more time auditing the benefits of highly paid employees relative to lowly paid employees. In addition, it should make this policy known to employers. By following this policy, the IRS can spend its auditing resources in such a way as to maximize taxpayer compliance with the tax laws concerned with employee benefits.[6]

Since, under U.S. tax laws, the top employee tax rate is 50 percent and the top corporate rate is 46 percent, there may be some highly paid executives in an organization for whom $t_w > t_e$. Expression (6) shows that the employer may have an incentive to pay benefits to some of these employees, even if it is certain that they will be found to be nondeductible. From the IRS's viewpoint, it might be wise to concentrate its auditing efforts on the benefits paid to these employees.

By analyzing the trade-off between b and m in the discussion surrounding equations (5) and (6), we have essentially been examining the trade-off between m and any $\beta_i > 0$. However, the trade-off between β_i and β_j has not been examined. We will now analyze this trade-off by making use of equation (4).

Equation (4) is affected by the level of δ_i and δ_j. All else held constant, additional β_j will become less preferred to β_i if δ_j increases. Accordingly, at high levels of income where it serves the employer to pay possibly nondeductible benefits, those benefits which are less certain to be found nondeductible become more attractive to pay. For example, suppose that β_i is pension plan contribution and β_j is expense account allowance. A high δ_i and a low δ_j would cause the right side of equation (4) to be small, thus increasing the amount of expense account relative to pension. It may be argued that, in fact, δ for pension is quite high in view of the statutory limitation on pension plan contributions and the fact that pension plans must file their own information returns with the IRS. Thus, it may not be difficult for the IRS to determine that an employer is making contributions to pension plans in excess of the maximum amount allowable. On the other hand, it may be argued that the δ for expense accounts is smaller due to the necessity for the IRS to actually audit the expense account to detect an amount above that allowed. Thus, once β_L is reached for pension contributions, it becomes more attractive for the employer to authorize excess expense account payments as opposed to additional pension contributions. In general, the same conclusion may be reached concerning all benefits commonly thought of as perquisites. Since δ for perquisites is probably lower than for most statutory benefits, when total benefits are high, perquisites become a preferred form of benefits from the employer's viewpoint. Our analysis of equation (1) has already indicated that it is reasonable to believe that, as workers' incomes increase, perquisites become more desirable from the worker's viewpoint. Accordingly, as employees' incomes increase, both their desire to receive perquisites and the employer's desire to pay perquisites increase.

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[6] We do not mean to imply that the IRS should refrain from auditing a wide spectrum of income classes. For a discussion of optimal IRS audit policy see Balachandran and Schaefer [1980].

V. CONCLUDING REMARKS

This study has examined the optimal combination of nontaxable benefits and monetary wages in the context of the employment relationship under various institutional constraints. We showed that, in the presence of minimum wage laws and IRS auditing, Figures 1 and 2 combine to produce a four-region expansion path of the optimal combinations of monetary compensation and nontaxable benefits. We also examined the types of benefits that enter employees' compensation packages as their incomes increase.

By assuming that the worker has already performed his or her task, we have chosen to ignore benefits such as stock options, which are paid primarily for incentive reasons, and concentrate our efforts on the tax effects associated with the payment of benefits. Future research might incorporate these incentive effects in an analysis of the optimal compensation contract in a taxable environment.

APPENDIX

Solution of Equation (2)

Assuming that $\beta_i > \beta_{Li}$ for all i, the Lagrangian for solving equation (2) is

$$L = (1 - t_e)\left[\frac{m}{1 - t_w} + \sum_{i=1}^{n} \beta_i\right] + t_e \sum_{i=1}^{n} \delta_i(\beta_i - \beta_{Li})$$

$$-\lambda[G(m, \beta_1, \beta_2, \ldots, \beta_n) - G(m^*, 0, 0, \ldots, 0)], \tag{A1}$$

where L is the Lagrangian function and λ is the Lagrangian multiplier. Taking the partial derivatives of L with respect to β_i and m, respectively, and setting the results equal to zero yields

$$1 - t_e(1 - \delta_i) = \lambda G_{\beta_i} \text{ and} \tag{A2}$$

$$(1 - t_e)/(1 - t_w) = \lambda G_m. \tag{A3}$$

(A2) divided by (A3) gives

$$MRS(m,\beta_i)=\frac{1-t_w}{1-t_e}1-t_e(1-\delta_i). \tag{A4}$$

When $\beta_i \leq \beta_{Li}$ for all i, all $\delta_i=0$ and (A4) becomes $MRS(m,\beta_i)=1-t_w$.

In similar fashion, it can be shown from (A2) that

$$MRS(\beta_i,\beta_j)=\frac{1-t_e(1-\delta_j)}{1-t_e(1-\delta_i)} \tag{A5}$$

for $i\neq j$ and $(\beta_i,\beta_j)>(\beta_{Li},\beta_{Lj})$. When $\beta_i \leq \beta_{Li}$, (A5) becomes $MRS(\beta_i,\beta_j)=[1-t_e(1-\delta_j)]/(1-t_e)$, and when $\beta_j \leq \beta_{Lj}$, (A5) becomes $MRS(\beta_i,\beta_j)=(1-t_e)/[1-t_e(1-\delta_i)]$. When $(\beta_i,\beta_j)\leq(\beta_{Li},\beta_{Lj})$, (A5) becomes $MRS(\beta_i,\beta_j)=1$ for $i,j=1,2,\ldots,n$ and $i\neq j$.

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THE ACCOUNTING REVIEW
Vol. LX, No. 4
October 1985

Predicting Current Cost Operating Profit Using Component Models Incorporating Analysts' Forecasts

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ABSTRACT: The accuracy of forecasts of one-year-ahead current cost earnings using four component models is examined. ASR 190 data for 1976 to 1978 and FAS 33 data for 1979 to 1981 are used in calculating current cost earnings for a sample of 129 firms. The component forecasting models also incorporate forecasts of certain components of historical cost net income developed by Value Line financial analysts. The forecast accuracy of the component models is compared to four benchmark models. A component model that incorporates analysts' forecasts of sales and changes in (historical cost) margins provides the most accurate forecasts for the aggregate sample and for two subsamples. It also provides similar or more accurate forecasts than the other models in eight of the nine industries examined. Thus, researchers may consider using this model when examining the incremental information content of current cost earnings *vis-a-vis* that of historical cost earnings.

In the past two decades, an extensive literature on forecasting historical cost earnings has developed. One focus has been on developing forecasts of one-year-ahead earnings. This research has employed increasingly sophisticated time-series models and has compared their forecasting accuracy to each other, to naive models, and to predictions by analysts and managers [Griffin, 1982, pp. 67–97]. In contrast, current cost data have not been available, and little research has been directed to developing and testing alternative current cost earnings expectation models. As part of its research program, the FASB has recognized the need for such research [FASB, 1981, p. 9, Qu. 2, 3]. This paper investigates the one-year-ahead forecasting accuracy of the annual current cost earnings series using models that incorporate analysts' forecasts of certain components of historical cost income. Those forecasts are compared to forecasts using four benchmark models.

Improved current cost earnings expectation models are potentially useful in capital market research examining the relationship between stock prices (or returns) and current cost data. The need for current cost earnings forecasts has been recognized by current cost theorists. Edwards and Bell [E & B, 1961] briefly discuss external uses of replacement cost

We would like to acknowledge the helpful comments of Lawrence Revsine, Henry Schwarzbach, and two anonymous reviewers.

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Manuscript received January 1984.
Revisions received October 1984 and March 1985.
Accepted May 1985.

information for security valuation, for potential entrants into an industry, and for national income accounting, observing that for many external uses "the assumption is made that current reported profits can be projected into the future or at least serve as an index number for such projections" [E&B, 1961, p. 103, n. 5]. Revsine's analysis [1973] of the potential relationship between current cost information and future cash flows, particularly the extrapolation method, involves prediction of the subsequent period's current cost earnings. And finally, forecasts of current cost earnings would be useful in developing current-cost-based security valuation models. While only a few firms in the U.S. have experimented with such models [Norby, 1983, p. 36], a major English firm, de Zoete & Bevan [1980], employs share valuation models that use forecasts of current cost earnings.

EARNINGS EXPECTATION MODELS

Component Models

Earnings is the aggregate of components such as sales, cost of sales, depreciation, and selling, general, and administrative expenses. Earnings forecasts can be developed by forecasting those components and summing them to obtain a forecast of aggregate earnings. Several approaches can be used to predict sales. For example, analysts' forecasts of sales could be used or a quantitative model, such as an econometric or times-series model, could be developed. Since many expense items generally move in proportion to sales revenue, there is no need to forecast each expense item separately. Instead, estimated sales revenue can be multiplied by an estimated profit margin to obtain an estimate of current cost earnings. Alternatively, sales revenue can be multiplied by an estimated contribution margin with the resultant product then reduced by an estimate of depreciation.

An appealing attribute of component-based earnings expectation models is that they parallel the process actually used by financial analysts to develop earnings estimates for a diversified firm [Backer and McFarland, 1968, pp. 9–10]. More importantly, studies by Kinney [1971], Collins [1976], and Baldwin [1984] have shown that component models are relatively accurate with historical cost data, although Barnea and Lakonishok [1980] argue the evidence is not conclusive.

The component models in this study use data from three sources. Current cost data for 1979, 1980, and 1981 were obtained from the FASB Statement 33 data bank Version II [Vasarhelyi, Phillips and Yang, 1983] and annual reports. Various historical cost data for 1976 to 1981 and ASR 190 replacement cost data for 1976, 1977, and 1978 were taken from The Value Line Data Base and Forms 10-K. Forecasts of sales, historical cost depreciation, and historical cost net income for 1977 to 1981 were collected by hand from *The Value Line Investment Survey*. This report is the only publicly available source known to the authors that presents analysts' forecasts of income statement components, such as sales and depreciation. We preferred to use forecasts by analysts in our models because they are potentially able to incorporate into their forecasts a broad information set, including macro-economic data, industry forecasts, and firm-specific information (such as backlog data, contracts, and capital expenditure plans).[1]

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[1] Research has demonstrated that forecasts by Value Line analysts are relatively accurate. For example, Brown and Rozeff [1978] report that annual (and quarterly) earnings forecasts by Value Line analysts are significantly more accurate than forecasts from naive models and Box-Jenkins time-series models. Studies also indicate that Value Line earnings forecasts are as accurate as forecasts from both *Standard and Poors*

All forecast data used in the component models were available at the beginning of the year to which the forecasts relate. In particular, the Value Line forecasts were made conditional upon knowledge of the past year's annual financial results but prior to the release of the first quarter results. The models are the best we could design using the one-year-ahead forecasts available from *The Value Line Investment Survey* (sales, depreciation, and net profit on a historical cost basis). Let

$\widehat{CCI}$ = forecast of current cost income before extraordinary items,

CCI = actual current cost income calculated as historical cost income before extraordinary items plus historical cost depreciation and cost of sales less either ASR 190 replacement cost or FAS 33 current cost depreciation and cost of sales,

i = firm,

t = current annual period,

$\hat{S}$ = forecast of sales from *The Value Line Investment Survey*,

S = actual sales,

$\widehat{HCM}$ = forecast of historical cost profit margin calculated by dividing forecasted net income by forecasted sales ($\hat{S}$), both from *The Value Line Investment Survey*,

HCM = actual historical cost profit margin calculated by dividing actual net income before extraordinary items by actual sales(S),

$\widehat{CCD}$ = forecast of current cost depreciation[2],

$= CCD_{i,t-1}{*}(1+\hat{r}_t)+\widehat{HCD}_{i,t} - HCD_{i,t-1}$,

CCD = actual current cost depreciation using ASR 190 data for 1976 to 1978 and FAS 33 data from 1979 to 1981,[3]

$\hat{r}$ = consensus one-year-ahead forecast of change in GNP Implicit Price Deflator, from annual issues of *Business Forecasts*,

$\widehat{HCD}$ = forecast of historical cost depreciation from *The Value Line Investment Survey*, and

HCD = actual historical cost depreciation.

The four component-based earnings expectation models are:

Earnings Forecaster and some more expensive, privately-distributed forecasts by analysts [Richards, 1976; Brown and Rozeff, 1978, p. 12, n. 18]. In addition, Jaggi [1980] reports that for firms with revenues greater than $500 million, which includes most of the firms in our sample, *Value Line* earnings forecasts are as accurate as forecasts by management.

[2] This formula uses one-year-ahead forecasts of the *GNP* Implicit Price Deflator as a surrogate for one-year-ahead forecasts of price changes in plant and equipment. Forecasts of a more specific price index are not available. The formula also assumes that historical cost and current cost depreciation for assets acquired (disposed of) during the forecasted year will be similar. Historical cost and current cost depreciation on assets acquired would be similar unless input prices change dramatically during the year and most of the investment in new assets is made either at the beginning or the end of the year. Depreciation on asset dispositions would be similar under the two reporting methods if dispositions are immaterial or most disposed assets are fully depreciated.

[3] The ASR 190 replacement cost depreciation expense reported by *Value Line* frequently is not the same amount that appears in the 10-K footnote. Instead, *Value Line* calculates replacement cost depreciation as the "differential" from the 10-K footnote (i.e., current cost less a comparable historical cost amount) plus *Value Line* historical cost depreciation (often taken from the Statement of Changes in Financial Position) [Value Line, 1981, Ch. 8, p. 1]. Thus, the *Value Line* depreciation amounts—*HC* and *RC*—are compatible with one another, and *RC* can be substituted for *HC* on the income statement to arrive at *RC* earnings (after doing the same substitution for cost of goods sold). Unfortunately, FAS 33 data base current cost depreciation amounts are often not compatible with *Value Line* historical cost amounts. Therefore, we examined 1979 to 1981 annual reports for every firm in our sample and adjusted the FAS 33 data base depreciation amounts to maintain the differential from the FAS 33 footnotes. Likewise, cost of goods sold was adjusted in the FAS 33 data base so that it was compatible with *Value Line* and so that the entire differential in *HC* and *CC* income from continuing operations would be captured by substituting *RC* depreciation and cost of goods sold for their *HC* counterparts.

Model 1 (Analysts' sales forecast times random walk forecast of current cost profit margin):

$$\widehat{CCI}_{i,t}=\hat{S}_{i,t}\left(\frac{CCI_{i,t-1}}{S_{i,t-1}}\right)$$

Model 2 (Analysts' sales forecast times forecast of current cost profit margin incorporating analysts' forecast of change in [historical cost] profit margin):

$$\widehat{CCI}_{i,t}=\hat{S}_{i,t}\left(\frac{CCI_{i,t-1}}{S_{i,t-1}}+\widehat{HCM}_{i,t}-HCM_{i,t-1}\right)$$

Model 3 (Analysts' sales forecast times forecast of current cost profit margin incorporating analysts' forecast of proportional change in [historical cost] profit margin):

$$\widehat{CCI}_{i,t}=\hat{S}_{i,t}\left(\frac{CCI_{i,t-1}}{S_{i,t-1}}\right)\left(\frac{\widehat{HCM}_{i,t}}{HCM_{i,t-1}}\right)$$

Model 4 (Analysts' sales forecast times random walk forecast of current cost profit margin before depreciation, less forecasted current cost depreciation incorporating analysts' forecast of the change in historical cost depreciation):

$$\widehat{CCI}_{i,t}=\left(\hat{S}_{i,t}*\frac{CCI_{i,t-1}+CCD_{i,t-1}}{S_{i,t-1}}\right)-\widehat{CCD}_{i,t}$$

All four component models incorporate analysts' sales forecasts. Models 1, 2, and 3 multiply forecasted sales by an estimate of one-year-ahead current cost profit margins. Model 1 uses a random walk (no change) forecast. Model 2 assumes current cost margins change by the same amount as the forecasted change for historical cost margins. For example, assume that the current cost profit margin in period $t-1$ was six percent and that analysts forecast that the historical cost profit margin will increase two percentage points (from 12 percent to 14 percent). In this case, model 2 would forecast the current cost margin in period t to be eight percent, and model 3 would forecast the firm's current cost margin in period t to increase to seven percent (six percent × (14 percent/12 percent) = seven percent). Model 4 employs a somewhat different approach, providing separate estimates of fixed and variable expenses. This is the general approach that has been employed in models used by some investment firms.[4] Model 4 incorporates a random walk forecast of a contribution margin with an estimate of depreciation expense.

Models 2 and 3 incorporate analysts' forecasts of (historical cost) margins. Forecasts of historical cost margins would incorporate both expected changes in costs of production and expected changes in pricing practices. Direct forecasts of current cost margins, if available, would also incorporate expected changes in the same two factors. The primary difference in the forecasts would be caused by the current cost method more quickly incorporating changes in costs of production into reported margins. In other words, forecasted changes in historical cost margins would lag behind forecasted changes in current cost margins. This lag factor would seriously impair forecast accuracy only in periods of volatile price changes. A comparison of the forecast accuracy of models 2 and 3 with model 1, which incorporates a random walk margin forecast, provides an indication of the gain (if any) in forecast accuracy from incorporating analysts' forecasts of historical cost margins.

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[4] For example, Callard, Madden & Associates [1982, pp. 11–12] uses a component model that separately estimates fixed expenses in developing forecasts of one-year-ahead "real" profits. Their objective is to estimate real *ROI*. While their measure of real profits is not based on current cost data, Norby [1983, p. 36] reports that Aetna Life and Casualty has been experimenting with the Callard Madden approach using current cost data.

Benchmark Models

Four models are used as benchmarks to determine to what extent, if any, incorporating analysts' forecasts of income components improves forecast accuracy. Because current cost data are available only since 1976 and quarterly current cost data are not available, sophisticated time-series models could not be developed. Instead, the following four models were used:

Model 5 (Random walk model):

$$\widehat{CCI}_{i,t} = CCI_{i,t-1};$$

Model 6 (Random walk model adjusted for anticipated nominal macro economic growth):

$$\widehat{CCI}_{i,t} = CCI_{i,t-1}(1 + \widehat{GNP}_t);$$

Model 7 (Random walk model adjusted for anticipated inflation):

$$\widehat{CCI}_{i,t} = CCI_{i,t-1}(1 + \widehat{CPI}_t);\ \text{and}$$

Model 8 (Random walk model adjusted for realized inflation):

$$\widehat{CCI}_{i,t} = CCI_{i,t-1}(1 + CPI_t),$$

where

$\widehat{GNP}_t$ = consensus one-year-ahead forecasts of annual changes in nominal *GNP*, from annual issues of *Business Forecasts*,

$\widehat{CPI}_t$ = consensus one-year-ahead forecasts of annual changes in the *CPI*, from annual issues of *Business Forecasts*, and

CPI_t = realized changes in annual *CPI*, from various issues of the *Survey of Current Business*.

Model 5 has proven to be surprisingly robust across a variety of economic contexts and has been used as a benchmark to examine forecast accuracy in numerous studies. Model 6 presumes that current cost profits move in tandem with growth in the economy, as suggested in an FASB newsletter by Evans and Freeman [1983]. This model would seem most appropriate for firms that have operations in several industries. Since forecasted changes in nominal *GNP* are used as a measure of economic growth, model 6 incorporates forecasted changes in both real output and inflation. Models 7 and 8 were used because the component models may have an advantage over a simple random walk model by incorporating anticipated inflation though the sales forecast component. (Since model 8 uses *ex post* changes in the *CPI*, while the component models use only *ex ante* data available one year ahead, it introduces a bias against finding that one or more component models outperform the benchmark models.)

RESEARCH DESIGN

Research Question

Do any of the component models consistently provide more accurate forecasts across the aggregate sample? If so, does that model also provide more accurate forecasts for individual industries?

Sample Selection

Sample firms were selected on the basis of the availability of data needed to develop forecasts (as is customary in forecast studies). Table 1 contains a reconciliation of the 129 firms in our sample to the population of firms contained in the FAS 33 data bank. The firms in our sample report either ASR 190 or FAS 33 data for each year from 1976 to 1981. The same firms are in our sample for each year in order to assess more accurately the effect, if any, on forecast accuracy of using both ASR 190 and FAS 33 data during the test period. If different firms

TABLE 1

RECONCILIATION OF SAMPLE TO POPULATION

Number of nonfinancial firms on FAS 33 Tape		1135
Less[a]:	Utilities[b]	152
	Firms in specialized industries[c]	145
	Firms experiencing a name change, merger, etc., that altered their status during the test period	103
	Firms with year-end other than December or January (1981 data not in FAS 33 data base for these firms)	182
	Firms not reporting FAS 33 current cost depr. and CGS for all three years (1979–1981)	143
	Firms not reporting ASR 190 replacement cost depr. and CGS for all three years (1976–1978)	204
	Complete forecast data not available in *The Value Line Investment Survey*	20
	Annual reports and/or 10Ks not available in library to make changes described in footnote 3	28
	Inadequate information in firm's footnotes to make changes described in footnote 3	29
Firms in the sample		129

[a] Each category includes the number of firms exhibiting a particular characteristic after prior eliminations had been made (i.e., not necessarily the total number in the data base with that characteristic).

[b] The unique nature of the business operations of utilities and their widespread application of the net recoverable amount provisions of FAS 33 [Evans and Freeman, 1983, p. 5] result in data that are not comparable with non-utilities.

[c] Many of these firms report historical cost/constant dollar data as current cost data as allowed by FASB Statements no. 40, 41, 46 and 69.

were in the sample each year, we would not know whether to attribute any differences in findings for the ASR 190 and FAS 33 subperiods to differences in the methods used to calculate current cost or to the inclusion of different firms.

Error Metrics

In the absence of knowledge of users' utility functions, ambiguity exists regarding the choice of an error metric. Consequently, forecast accuracy was examined using two error metrics: mean absolute error as a percentage of sales and Theil's *U* coefficient.

Mean absolute error as a percentage of sales is:

$$MAEPS=\left|\frac{\widehat{CCI}_{i,t}-CCI_{i,t}}{S_{i,t}}\right|.$$

This error metric was used instead of the more customary mean absolute percentage error (MAPE) based on income because current cost income before extraordinary items (CCI) is often close to zero.

Thiel's [1966] *U* coefficient is the square root of

$$U^2_{i,j}=\frac{\sum_{t=1}^{T}(P_{i,j,t}-A_{i,t})^2}{\sum_{t=1}^{T}A_{i,t}^2},$$

where

$A_{i,t}$ = change in actual earnings of firm i from $t-1$ to t (i.e., $CCI_{i,t}-CCI_{i,t-1}$),

$P_{i,j,t}$ = predicted change in earnings of firm i from $t-1$ to t by forecast

TABLE 2

FORECAST ACCURACY FOR AGGREGATE SAMPLE

	Mean Absolute Error as a Percentage of Sales							
	ASR 190 Years			*Transition Year*	*FAS 33 Years*			*All Years*
Component Models	*1977*	*1978*	*1977–78*	*1979*	*1980*	*1981*	*1980–81*	*1977–1981*
Model 1	.0190	.0173	.0182	.0190	.0172	.0159	.0165	.0177
Model 2	.0190	.0155	.0172	.0196	.0114	.0141	.0127	.0159
Model 3	.0246	.0208	.0227	.0218	.0149	.0558	.0353	.0276
Model 4	.0190	.0175	.0182	.0196	.0169	.0159	.0164	.0178
Benchmark Models								
Model 5	.0192	.0184	.0188	.0195	.0161	.0163	.0162	.0179
Model 6	.0193	.0179	.0185	.0191	.0168	.0159	.0163	.0178
Model 7	.0192	.0179	.0185	.0191	.0172	.0160	.0166	.0179
Model 8	.0192	.0178	.0185	.0190	.0177	.0159	.0168	.0179

model j (i.e., $\widehat{CCI}_{i,j,t} - CCI_{i,t-1}$), and

T = total number of time series observations.

Given forecast method j and earnings time series data on firm i, Theil's U compares the forecast accuracy of method j to that of a naive, no-change earnings forecast model.[5]

Our findings are consistent in all important respects across these two error metrics. Therefore, we present results using only the first.

Statistical Methods

Without direct information on the costs of imperfect forecasts to users, researchers normally evaluate forecast accuracy statistically. The nonparametric Friedman analysis of variance for related samples [Hollander and Wolfe, 1973] was used to determine the level of statistical significance of the differences in forecast accuracy among the models. The forecast model yielding the smallest *MAEPS* for a particular firm was given a rank of one, while the model yielding the largest *MAEPS* was given a rank of eight. Then the average rank of each model over all firms and forecast years was computed. Statistical significance is determined by differences among average ranks.

Multiple comparison tests were then conducted to determine the superiority of the individual forecast models. Paired comparisons were made using both the Wilcoxon signed ranks test for matched samples and the Friedman test, which for paired comparisons reduces to a sign test. The findings using the two nonparametric methods are very similar. Results using the Wilcoxon method are reported in the text.

RESULTS

For Aggregate Sample

The first part of the research question concerns whether there is a dominant forecasting model for the aggregate sample. Table 2 presents *MAEPS* values for each model. Friedman ANOVAs for related samples indicate that for all years

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[5] Readers interested in previous applications in the accounting literature of Theil's U coefficient should see Barefield and Comiskey [1975] and Crichfield, Dyckman and Lakonishok [1978].

TABLE 3

FORECAST ACCURACY BY INDUSTRY FOR ALL YEARS (1977 TO 1981)

		Mean Absolute Error as a Percentage of Sales								
		Component Models				*Benchmark Models*				*Friedman ANOVA*
Industry (Number of Firms)	*Two-Digit SIC Code*	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*	*Model 7*	*Model 8*	*Significance Level*
Food (9)	20	.0161	.0107	.0190	.0180	.0152	.0151	.0148	.0149	.1354
Chem., Drug, Textiles (22)	28	.0178	0.161	.0182	.0180	.0190	.0182	.0184	.0184	.0668
Containers, Build, Mat. (9)	32	.0261	.0266	.1313	.0260	.0253	.0263	.0262	.0264	.7669
Steel & Metal Refin. (14)	33	.0267	.0239	.0370	.0259	.0242	.0263	.0257	.0260	.0009
Metal Materials (8)	34	.0112	.0106	.0108	.0113	.0111	.0111	.0113	.0113	.3992
Machinery (13)	35	.0185	.0172	.0227	.0183	.0195	.0190	.0194	.0195	.0043
Elec. Equip. (12)	36	.0128	.0114	.0129	.0125	.0142	.0131	.0136	.0137	.0110
Transportation Equip. (10)	37	.0102	.0098	.0101	.0109	.0107	.0102	.0104	.0104	.3692
R & D Instruments (6)	38	.0172	.0163	.0183	.0180	.0185	.0173	.0176	.0175	.2818

forecasted (1977-1981), as well as for the ASR 190 subperiod (1977-1978) and the FAS 33 subperiod (1980-1981),[6] the forecast accuracy of at least one model is significantly different from the other models at the .001 level of statistical significance. Visual examination of the levels of *MAEPS* in Table 2 indicates that model 2 provides more accurate forecasts than the other models for all years forecasted, as well as for the ASR 190 and FAS 33 subperiods.[7] It is also reasonably accurate for each of the individual years. Pairwise comparisons using the Wilcoxon Signed Ranks Test for Matched Samples indicate that model 2 provides more accurate forecasts than each of the four benchmark models for all years forecasted (1977-1981) at the .001 level of statistical significance. Pairwise comparisons for the FAS 33 subperiod and ASR 190 subperiod are statistically significant at the .001 and .05 significance levels, respectively.

Paired comparisons among the four component models indicate that forecasts by model 2 are also more accurate than forecasts using the other three component models at the .001 significance level for all years forecasted. This finding also holds for the FAS 33 subperiod (at the .001 level), but for the ASR 190 subperiod, the more accurate forecasts provided by model 2 are generally not statistically significant.

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[6] As discussed previously, ASR 190 data were used for 1976 to 1978 and FAS 33 data were used for 1979 to 1981. Since the change in the effective pronouncement controlling the calculation of the data is a potentially confounding variable, we separately report results for the ASR 190 subperiod, the FAS 33 subperiod, and all years forecasted. Note that, since one year of data must be available to develop forecasts, three years of data allow forecasts for two years. ASR 190 data for 1976 and 1977 are incorporated into forecasts for 1977 and 1978, respectively. FAS 33 data for 1979 and 1980 are incorporated into forecasts for 1980 and 1981, respectively. Note that 1979 is a "transition" year in that ASR 190 data from 1978 are used to forecast FAS 33 results for 1979.

[7] Readers accustomed to evaluating forecast accuracy using *MAPE* (mean absolute percentage error based on income) may find it helpful to know that the ratio of sales to the absolute value of current cost profit or loss is approximately 32 for our sample. Therefore, errors that appear small when expressed using *MAEPS* may be of a material magnitude using *MAPE*. (Recall that we did not use *MAPE* because current cost profit is often close to zero, creating deceptively large values of *MAPEs*.)

By Industry

The relative forecast accuracy for individual industries is of interest because analysts often specialize by industry. Moreover, research on the accuracy of analysts' forecasts of historical cost income indicates that forecast accuracy varies by industry [Barefield and Comiskey, 1975; Richards, 1976]. Examining the forecast errors presented in Table 3 for 1977 to 1981, model 2 provides similar or more accurate forecasts than the four benchmark models in eight of the nine industries examined (the exception is containers and building materials). Model 2 also provides forecasts of similar or greater accuracy than the other three component models in all industries. While data for the subperiods are not presented, the superiority of model 2 exists for both subperiods, although its superiority is particularly evident in the FAS 33 subperiod.

Conclusions and Limitations

Two limitations of the analyses reported in this study should be noted before presenting our conclusions. First, the benchmark models are the best models we could develop with the limited annual time-series of data available (three years of ASR 190 data and three years of FAS 33 data). More accurate benchmark models could change the results. Second, our sample of firms was not randomly selected (see Table 1), and our results may not generalize to other firms.

Subject to the limitations of our analyses, the following conclusions can be drawn. As previously discussed (in footnote 1), extensive evidence exists that analysts' forecasts of historical cost earnings are significantly more accurate than forecasts using time-series models. Consistent with this finding, our results indicate that analysts' forecasts can also be used to develop more accurate one-year-ahead forecasts of annual current cost earnings.

The component model that provides the most accurate forecasts assumes that one-year-ahead current cost margins will change by the same amount as the forecasted change in historical cost margins. Component model 2 provided more accurate forecasts than any of the benchmark models over the entire test period (1977–1981) and over both the ASR 190 and FAS 33 subperiods. It also provided similar or more accurate forecasts than the other models in eight of the nine industries examined. The direct implication of this finding is that model 2 could be used to predict current cost earnings for capital market tests of information content, for input into current-cost-based security valuation models, and for other uses.

The superiority of model 2 also has implications for assessing the results of extant capital market studies. Those capital market studies that have used the percentage change in current cost earnings between consecutive years as an *ex post* measure of unexpected earnings have not used an optimum measure. As Beaver and Landsman [1983, p. 58] comment: "the use of percentage changes ostensibly implies that the expected change is zero (e.g., as implied by a martingale or random-walk-with-no-drift model)." Our results indicate that model 2 outperforms a random walk model (model 5). In effect, model 2 predicts that the one-year-ahead current cost profit will change by the same dollar amount as the forecasted change in historical cost profit. This result suggests that the information content of current cost earnings is better calculated as a function of the change in historical cost earnings.[8]

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[8] This statement presumes an efficient capital market and the *ex ante* model which proves best in *ex post* analysis is expected to be best *ex ante.*

APPENDIX A
SAMPLE FIRMS BY INDUSTRY CLASSIFICATION

SIC Code	*Firm Name*	*SIC Code*	*Firm Name*	*SIC Code*	*Firm Name*
15	Dillingham Corp.	30	Goodrich (B.F.)	35	Sealed Power Corp.
16	Dravo Corp.	30	Rubbermaid, Inc.	35	Smith Int'l Inc.
20	American Bakeries	30	Uniroyal, Inc.	35	UMC Industries
20	Anheuser-Busch Cos.	32	Certain Teed Corp.	35	Wean United Inc.
20	Bordon, Inc.	32	General Refractories	35	AMP, Inc.
20	General Host	32	Guardian Inc.	36	Champion Spark Plug
20	Kellogg Co.	32	Kaiser Cement Co.	36	General Electric
20	Nabisco Brands	32	Libby Owens Ford	36	Gould, Inc.
20	National Distillers	32	Lone Star Ind., Inc.	36	Maytag Co.
20	Pepsico, Inc.	32	National Gypsum	36	Motorola, Inc.
20	Southdown, Inc.	32	Owens-Illinois, Inc.	36	RCA Corp.
21	American Brands	32	PPG	36	Singer Co.
21	Philip Morris	33	Aluminum Co. of Amer.	36	Texas Instruments
21	U.S. Tobacco	33	Athlone Industries	36	Westinghouse Elec.
22	Akzona Industries	33	Brush Wellman	36	Whirlpool Corp.
22	Fieldcrest Mills	33	Copperweld Corp.	36	Zenith Radio
23	Jonathan Logan, Inc.	33	Inland Steel	37	Federal-Mogul
23	Warnaco, Inc.	33	Interlake, Inc.	37	Fruehauf Corp.
27	Deluxe Check Print	33	LTV Corp.	37	Grumman
27	Washington Post "B"	33	Lukens, Inc.	37	Lockheed Corp.
28	Abbott Laboratories	33	Midland-Ross Corp.	37	McDonnell Douglas Co.
28	American Cyanamid	33	National Steel	37	Ogden Corp.
28	Baxter Travenol Labs	33	Phoenix Steel	37	Purolator, Inc.
28	Beker Industries	33	Revere Cooper & Brass	37	Sundstrand Corp.
28	Bristol-Myers	33	Reynolds Metals	37	TRW Inc.
28	Chesebrough-Ponds	33	Tyler Corp.	37	Thiokol Corp.
28	Dow Chemical	34	Barnes Group	38	American Hosp. Sup.
28	Ethyl Corp.	34	Combustion Eng.	38	Ametek, Inc.
28	FMC Corp.	34	Crown Cork & Seal	38	Bausch & Lomb
28	Grace (W.R.)	34	Easco	38	Johnson & Johnson
28	Hercules Inc.	34	Emhart Corp.	38	Polaroid Corp.
28	Lubrizol Corp.	34	Masco Corp.	38	Sybron Corp.
28	Merck & Co.	34	Signode Corp.	39	Brunswick Corp.
28	Monsanto Co.	34	White Consolidated	39	U.S. Industries
28	Olin Corp.	35	Burroughs Corp.	45	PSA
28	Reichhold Chemicals	35	Chicago Pneumatic	47	ACF Industries
28	Rohm and Haas	35	Clark Equipment	47	Transway Int'l Corp.
28	Smithkline Beckman	35	Colt Industries	48	CBS Inc.
28	Stauffer Chemical Co.	35	Honeywell Inc.	50	Grainger (W.W.)
28	Sun Chemical	35	Hughes Tool	50	Robertshaw Controls
28	Union Carbide	35	Ingersoll-Rand Co.	51	Di Giorgio Corp.
28	Upjohn Co.	35	NCR Corp.	59	Pargas, Inc.
29	Amerada Hess	35	Pitney-Bowes	73	Dun & Bradstreet

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THE ACCOUNTING REVIEW
Vol. LX, No. 4
October 1985

NOTES

Further Evidence on the Representativeness of Management Earnings Forecasts

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ABSTRACT: The primary purpose of the study is to provide evidence on the characteristics of firms which did and did not disclose management's annual earnings forecasts in the *Wall Street Journal.* The study finds that earnings variability is greater for non-disclosing firms while firm size is larger for disclosing firms. Systematic market risk was not significantly different between the two groups of firms. To the extent that earnings variability and firm size influence forecast accuracy and information content, the results reported in this study suggest that the accuracy and information content of voluntarily disclosed forecasts may not be representative of the accuracy and information content of the forecasts of currently non-disclosing firms if forecasts for these firms become required.

INTRODUCTION

FORECASTING disclosure policy has been a topic of interest for some time. Much of the discussion has centered on the question of whether management should be required to make earnings forecasts public. In 1979, the FASB circulated a discussion memorandum entitled "Analysis of Issues Related to Reporting Earnings" which raised the following two questions: 1) Do management forecasts of future earnings provide information which improves investors' assessments of future earnings? and 2) If assessments of future earnings are improved, will the benefits accruing to investors exceed the costs associated with public disclosure of management's forecasts?[1]

Research using voluntary management forecasts or security analyst forecasts has addressed issues ranging from forecast accuracy [Cragg and Malkiel, 1968; Daily, 1971; Neiderhoffer and Regan, 1972; Elton and Gruber, 1972; Copeland and Marioni, 1972; McDonald, 1973; Basi, Carey, and Twark, 1976; and Lorek, McDonald, and Patz, 1976] to the information content in managements' forecasts as reflected in security prices [Fos-

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[1] For a discussion of related costs see FASB [1979] and Gonedes, Dopuch, and Penman [1976].

The author wishes to acknowledge Gerald Salamon, David Burgstahler, and two anonymous reviewers for helpful comments on earlier drafts of this paper. Any shortcomings are the author's responsibility.

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Manuscript received May 1983.
Revisions received March 1984 and November 1984.
Accepted February 1985.

ter, 1973; Gonedes, Dopuch, and Penman, 1976; Patell, 1976; Jaggi, 1978; and Cox, 1981]. The research dealing with forecast accuracy provides information about the magnitude and distributional properties of forecast errors for both security analysts and management, but offers little evidence about whether such forecasts improve investors' assessments of future earnings. On the other hand, research using security-price methods indicates that voluntarily disclosed management forecasts are related to observable reactions in the securities market. Consequently, it might be concluded that managements' earnings forecasts are of benefit to investors and that the costs of requiring published forecasts should be investigated. However, one question, which attaches to most disclosure issues relating to nonextant policy, remains [May and Sundem, 1976]. Are voluntarily disclosed forecasts representative of the forecasts that could be produced if all firms were required to publish forecasts? If not, then previous research findings using voluntarily disclosed forecasts may not provide a sound basis for forming policy regarding mandatory disclosure of earnings forecasts.

Imhoff [1978] provided the first research evidence documenting firm characteristics that were systematically different between firms which published management earnings forecasts in the *Wall Street Journal* (WSJ) and those which did not. Characteristics were selected for study on the basis of their potential ability to influence forecast accuracy. Differences between firms were found, and Imhoff concluded that published forecasts may not be representative of the forecast accuracy which non-forecast firms might report if forecasts were required. The primary purpose of this study is to extend Imhoff's analysis and provide additional evidence on the characteristics of firms which did and did not have management earnings forecasts published in the *Wall Street Journal.*[1]

REVIEW OF PREVIOUS RESEARCH

Imhoff's research reported on three different attributes which he found to be significantly different between forecast disclosing and non-disclosing firms. The variables included in Imhoff's study were: 1) earnings variability surrogated by a time-series model which detrended earnings and by the coefficient of variation (CV) in earnings; 2) security analysts' mean absolute relative prediction errors (RPEs); and 3) systematic market risk (beta).

Imhoff's research disclosed that the variability in earnings and the error in security analysts' forecasts were significantly lower for voluntary forecast disclosure firms than for non-disclosing firms. Conversely, systematic market risk for voluntary forecast disclosure firms was found to be significantly greater (i.e., more risk) than the systematic market risk of non-disclosing firms. To the extent that the three attributes selected for study affect forecast accuracy, the empirical results suggest that the forecasts of disclosing firms are not representative of the accuracy which would be reported by non-disclosing firms if forecasts became mandatory. Imhoff's results, however, raise questions regarding the generalizability of his conclusions. Consequently, additional work appears to be warranted before any conclusions can be drawn

[1] Technically, there is a difference between the disclosure and publication of a forecast. Whether to disclose a forecast is a management decision; whether to publish a forecast is a WSJ editorial decision. While the decision to publish may depend upon factors such as company size and the degree of "surprise" in the forecast, it is assumed that most forecasts are considered newsworthy. Consequently, within the context of the current paper, the publication decisions of the WSJ editorial board are generally considered to reflect the forecast disclosure decisions of management.

TABLE 1

CORRELATION STATISTICS FOR SYSTEMATIC DIFFERENCE VARIABLES*

Systematic-Difference Variables N=368	*Beta*	*MV*	*CVNIAE*
BETA	1.0000		
MV	−.152 (.003)	1.0000	
CVNIAE	.308 (.000)	−.077 (.144)	1.0000

* Levels of significance are in parentheses. Correlation statistics for the other CV variables (CVOIBD, CVNIBE, and CVPEPS) were very similar to the correlation coefficients reported above for the CVNIAE variable.

about the representativeness of forecasts which are disclosed voluntarily. First, the relationship between beta and earnings variability in Imhoff's sample of forecast firms appears to differ with the relationship between these variables in other samples. Imhoff's results indicate that forecast firms have lower earnings variability and forecast errors but higher systematic market risk than non-forecast firms. Past research suggests that in general there is a positive rather than negative association between forecast accuracy, earnings variability, and systematic risk [Beaver, Kettler, and Scholes, 1970; Beidleman, 1973; Lev and Kunitsky, 1974; Barefield and Comiskey, 1975 and 1978; and Bowman, 1979].[3] Consequently, one would generally expect a sample of firms which has above-average betas to have above-average CVs for earnings.[4]

Finally, the correlation statistics reported in Table 1 of this study between the various CV of earnings measures and systematic market risk suggest that Imhoff's tests of hypotheses were interdependent. As a result, Imhoff's series of comparisons was inappropriate. Information about the marginal contribution of each test variable is needed. This study uses a matching process to control the interrelationships between test variables. Forecast and non-forecast firms are also matched by industry to the third digit of the SIC code.

This study retests the earnings variability and systematic market risk hypotheses of Imhoff, and adds a third hypothesis to test for differences in firm size:

Ho_1: There is no difference in the variability of accounting earnings for forecast firms versus non-forecast firms within the same industry.

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[3] For example, Barefield and Comiskey [1975, 1978] found a significant positive association between earnings forecast errors taken from Standard and Poors *Earnings Forecaster* and systematic market risk (Spearman $r=.513$). A similar association was also found between the coefficient of variation in earnings and systematic market risk (Spearman $r=.519$). In addition, Beaver, Kettler, and Scholes [1970] reported rank correlations between 1) the coefficient of variation in earnings and systematic risk, and 2) accounting beta and systematic risk of .66 and .44, respectively. More recently, Bowman [1979, p. 624–625] was able to show analytically that under certain restrictive assumptions, earnings variability and systematic market risk are positively related.

[4] This does not mean that Imhoff's results are necessarily in conflict since the positive relationship reported between forecast accuracy, earnings variability, and systematic market risk is an underspecified relationship. However, questions regarding the generalizability of his results still remain. The different beta and CV results found in Imhoff's sample of forecast firms may be explained by the fact that the control group of non-disclosure firms was 100 randomly selected COMPUSTAT firms in the earnings variability case and the Standard and Poor's 500 firms in the systematic market risk case. The use of different control groups for each variable makes it difficult to interpret the profile of forecast firm characteristics in Imhoff's sample unambiguously.

Ho$_2$: The systematic market risk of forecast firms is no different from the systematic market risk of non-forecast firms within the same industry.

Ho$_3$: There is no difference between the firm size of forecast firms versus the firm size of non-forecast firms within the same industry.

Firm size is an interesting study variable because of its potential ability to indirectly influence the amount of information content in management's forecasts [Atiase, 1980; Grant, 1978; Oppong, 1976]. The underlying theory posits that larger firms are generally associated with a greater flow of external sources of information than small firms. As a result, the difference between the market's expectation and the information revealed when a data item is publicly disclosed is less for larger firms; i.e., the greater the amount of pre-disclosure information production and dissemination, the greater the ability of market participants to anticipate the content of regularly issued disclosures such as earnings and possibly forecasts. Thus, firm size may be associated with the amount of information content in managements' forecasts.

The next section presents a discussion of the sample selection procedures and the methods used to test the three research hypotheses.

SAMPLE COLLECTION AND RESEARCH DESIGN

The sample selection criteria listed below define the characteristics of the forecasts included in the study. The forecast:

1. must be made by a firm included on the COMPUSTAT Annual Industrial file and CRSP Weekly Return files.[5]
2. must be disclosed in the *Wall Street Journal* between January 1, 1969 and December 31, 1976.[6]
3. must be expressed in terms of dollar earnings per share in one of the following formats: point, open range (minimum EPS forecasted), or closed range (minimum and maximum EPS forecasted).
4. must be a forecast of annual earnings originated by management.
5. must be disclosed prior to the end of the fiscal year being forecasted.

In total, 762 forecasts by 521 firms satisfied the above sample inclusion criteria. However, when more than one forecast for a firm occurred over the seven-year period, it was excluded from the sample, and only the most recent forecast was used in establishing a starting point for calculating the test variables. Thus, 241 multiple forecasts were excluded from the analysis, leaving a sample size of 521 firms and forecasts.[7]

Since Imhoff used the coefficient of variation in earnings as a surrogate for earnings variability, the same surrogate is used here. Four coefficient of variation (CV) measures (standard deviation of earnings over the mean earnings value) are used as measures of the variability of earnings.[8] Beta (B) of the well-known market model (see below) is used to surrogate systematic market risk. Firm size is surrogated by the ending-period market value (MV) of each firm's common stock. Hereafter, the above variables will be referred to, in the aggregate, as systematic-difference variables (SDV's).

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[5] The CRSP Weekly Returns file was derived from the Daily Returns file by Daniel Collins, University of Iowa.

[6] The sample of forecast firms was initially used in the author's dissertation. The period selected for study was long enough to ensure a large sample size and a diversity of market conditions.

[7] This is not meant to imply that the firm attributes selected for study are stable over time. However, inclusion of the values of test variables computed at different points in time, as determined by the year of forecast, for firms with multiple forecasts would violate the assumption of independent observations required by the statistical test.

[8] The different CV measures used are: 1) the CV of operating income before depreciation, CVOIBD; 2) the CV of net income before extraordinary items, CVNIBE;

The month of December in the *most recent* disclosure year was used as the starting point for calculating all SDVs. CVs were computed from the COMPUSTAT Industrial file using 15 years of data when possible (i.e., the most recent disclosure year plus the preceding 14 years), but in no case were less than ten years of data used.[9] The market value of common stock was computed at year-end for the most recent disclosure year.

The CRSP Weekly Return file was used to regress company security returns (R_{it}) against the CRSP equally-weighted market index (R_{mt}) to yield market model [Sharp, 1964] estimates of α_i and β_i:

$$R_{it} = \alpha_i + \beta_i R_{mt} + e_{it} \qquad (1)$$

Regressions were run over 72 weeks when possible, but in no case were less than 60 weeks of data used.

Similarly, SDV's were computed for all non-forecast firms that were on the CRSP and COMPUSTAT tapes and within each forecast firm industry over the same period of time to control for temporal differences. The SDV's of non-forecast firms selected from this group are compared against forecast firm SDV's in the difference tests discussed below.

Of the 521 firms which publicly disclosed their annual earnings forecasts in the WSJ, 373 firms had sufficient data on both the CRSP and COMPUSTAT data bases for computing systematic difference variables.[10] Table 1 reports the correlation coefficients (with related levels of significance in brackets) between the test variables.[11] The high correlations indicate that independent tests are inappropriate unless control is established over the remaining variables. The correlation coefficients indicate that in order to test for CV differences, the influence of B must be held constant. Similarly, tests of B differences between forecast and non-

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3) the CV of net income after extraordinary items, CVNIAE; and 4) the CV of primary earnings per share, CVPEPS. Imhoff [1978] used similar measures to surrogate earnings variability. Although the vast majority of earnings forecasts were stated in terms of EPS, the examination of net income before and after extraordinary items and before depreciation permits the impact of sub-components of income to be evaluated. Imhoff also used a time series test which yielded qualitatively similar results. The CV measure was used in the current study because of 1) its pervasive use in other studies as a surrogate for earnings variability, and 2) its reported association with systematic market risk (see Barefield and Comiskey [1975, 1978]; Beaver, Kettler, and Scholes [1970]; and Bowman [1979]). It should be pointed out that use of a CV measure as a surrogate for earnings variability does have limitations. Earnings may have an increasing or decreasing trend over time but still be easy to predict if deviations from trend are small. In this case the time-series measure and related test would be a more appropriate surrogate for earnings predictability. However, Imhoff noted no qualitative difference between the results of tests using time-series data or CV measures. Consequently, the CV measure was used in the current study.

[9] Since the various CV variables were computed over a ten- to 15-year period, questions may be raised regarding the stability of the CV values. On average, the typical forecast firm disclosed less than two forecasts during the eight-year study period. This may suggest that CV variables are not stable over time. On the other hand, there may be other unidentified factors which are not stable which influence management's disclose/do not disclose choice. To the extent that factors affecting CV stability are equally present in both the forecast and non-forecast firm groups, the effect of any CV instability on tests of differences would be held constant. However, to the extent that CV stability is different between the two firm groups, the difference in earnings predictability implied by the research results may not be adequately captured by differences in CV values.

[10] Durbin-Watson (DW) statistics were computed for the beginning sample of 373 forecast firms. Examination of the DW statistics for each of the 373 forecast regressions indicated that serial correlation existed in the residuals of ten, or less than three percent, of the 373 weekly return regressions. Thus, the nonsynchronous trading phenomenon should not have a biasing effect on the OLS estimates of beta.

[11] Five forecast firms had extremely large negative CV values which were distorting the results of the correlation analysis. These values ranged from −3.4955 to −46.8961 and were the only negative CV values in the beginning sample of 373 firms. Consequently, these five firms were

TABLE 2
MATCHING RESULTS: MEANS AND STANDARD DEVIATIONS

Matched Variables	*Test Variables*					
	CVs		*MV*		*B*	
$X_i(\delta)$	*FF*	*NFF*	*FF*	*NFF*	*FF*	*NFF*
B	.8803	.8789	.8875	.8821		
	(.3572)	(.3825)	(.3667)	(.3823)		
MV (000s)					569226	552780
					(831555)	(800450)
CVNIAE					.5190	.5101
					(.2703)	(.2598)
Matched Pairs	$n=202$		$n=213$		$n=91$	

FF = forecast firm
NFF = non-forecast firm

forecast firms require that both MV and CV values be held constant. Finally, tests involving the MV variable require control over beta.

Control over test variable interdependence was accomplished by matching non-forecast firms with forecast firms on the appropriate variables as indicated above. Matching was performed within industries to the third digit of the SIC code. Since it was not possible in many cases to select a non-forecast firm with a matched variable identical to the variable of its matched forecast firm, difference limits were arbitrarily preselected to strengthen the equality of the matched pairs included in the test samples. The largest acceptable difference between the two betas of a matched pair was set at .4. Pairs matched on either the MV or the CV variable values were excluded from test samples if the matched non-forecast firm variable differed from the matched forecast firm variable by more than half the value of the forecast firm variable. Also, since there were four different CV variables, the variable reporting the highest correlation with beta, CVNIAE, was used in matching CVs. Table 2 reports the means and standard deviations for the matched variables in each systematic-difference test case.[12]

A large number of the beginning 373 forecast firms was lost during the matching process due to the absence of non-forecast firms which: 1) were within the same industry group; 2) had data for computing SDVs over the same period of time; and 3) satisfied the difference limits set by the matching criteria. As indicated in Table 2, systematic-difference tests for CV values required matching on beta which subsequently reduced the sample size to 202 matched pairs. Tests of differences on the MV variable also required matching on beta and resulted in a test

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eliminated from the sample. Correlations between the various CV variables ranged from a high of .830 (between CVNIAE and CVNIBE) to a low of .512 (between CVOIBD and CVPEPS). Correlation coefficients between the CV variables omitted from Table 1 and the other test variables (B, MV) were similar to the correlations reported for the CVNIAE variable.

[12] A paired-difference t-test (two-tailed) was also conducted on each matched set of variables. The null hypothesis of no difference could not be rejected in any of the matched variable cases.

TABLE 3

SYSTEMATIC-DIFFERENCE VARIABLES AND LEVELS OF SIGNIFICANCE: WILCOXON SIGNED RANKS TEST

Systematic Difference Variables	*N*	*Z-Score**	*Mean Values*	
			Forecast Firms	*Non-Forecast Firms*
CVOIBD	202	−.07 (.944)	.5637	.5863
CVNIBE	202	2.11 (.035)	.7211	1.1874
CVNIAE	202	2.09 (.039)	.7627	1.1168
CVPEPS	202	2.03 (.042)	.6557	.9625
BETA	91	.81 (.420)	.8447	.8824
MV (000s)	213	−3.12 (.002)	476,093	362,807

* Levels of significance in parentheses.
N = Number of matched pairs

sample of 213 matched pairs. To test for differences in beta, matching was performed on both the MV and CVNIAE variables, resulting in a sample size of 91 matched firms.

TESTS OF HYPOTHESES

A Wilcoxon signed ranks test [Conover, 1971] is used to test the null hypothesis of no difference between the SDVs of forecast and non-forecast firms. Six separate tests are performed, one for each of the six systematic-difference variables (four of which are CV variables). Statistically, the research hypotheses can be stated in the following form:

Ho_1: $CV_{iF} - CV_{iNF} = 0$
Hr_1: $CV_{iF} - CV_{iNF} \neq 0$

Ho_2: $B_{iF} - B_{iNF} = 0$
Hr_2: $B_{iF} - B_{iNF} \neq 0$

Ho_3: $MV_{iF} - MV_{iNF} = 0$
Hr_3: $MV_{iF} - MV_{iNF} \neq 0$

where

i = the matched pair index $1, \ldots, n$
F = forecast firm SDV, and
NF = non-forecast firm SDV.

The results of the Wilcoxon test are summarized in Table 3, where the summed ranks of negative differences (forecast firm values—non-forecast firm values) were used as test statistics. Table 3 also shows the mean values of the test variables for the forecast and matched non-forecast firm groups. The null hypotheses for the CV variables can be rejected at the .05 level of significance in every case but one: the test for the CVOIBD variable, where no difference was found. Test results for the other CV variables lead to qualitatively similar conclusions: forecast firms have significantly lower CV of earnings measures than non-forecast firms within the same industry. The results are consistent with Imhoff's findings and suggest that forecast firms have less variability in earnings, but only after fixed charges, e.g. depreciation, are included in the income numbers. Findings of no difference for the CVOIBD variables and significant differences for all other CV variables imply that non-forecast firms have a higher degree of operating leverage in their cost structures relative to forecast firms. Since business risk depends in part on the extent to which a firm builds fixed costs into its operations, these results suggest, *ceteris paribus,* that business risk is lower for forecast firms than for non-forecast firms.

The results of the beta test disclosed that the null hypothesis cannot be rejected at the .05 level of significance. Consequently, after controlling for industry, firm size, and earnings variability, there does not appear to be any significant difference in the beta characteristics between forecast and nonforecast firms. Rubinstein [1973] has shown that the effect of nondiversifiable risk on the expected rate of return to equity can be separated analytically into two components: business risk (operating leverage) and financial risk (financial leverage). By matching on the CVNIAE variable, the business risk portion of systematic market risk is at least partially controlled, and this may explain why significant beta differences were not observed. These results would also seem to imply that financial leverage is not a point of difference between forecast and nonforecast firms.

To make the test results more comparable with the Imhoff study, a second Wilcoxon test was conducted on beta differences for pairs ($n=158$) matched on firm size only. In this case the null hypothesis was rejected at the .044 level of significance, indicating that the CVNIAE variable was able to exert a significant influence over the beta results. A third beta test, which did not hold earnings variability or firm size constant, reported results nearly identical to the above test in which the betas of non-forecast firms were significantly higher than the betas of forecast firms. Although exactly opposite from the results reported by Imhoff, the significant beta differences reported by the above tests vary in the same direction between forecast and non-forecast firms as the earnings variability measures and are in agreement with past research efforts which have reported a positive relationship between beta and the coefficient of variation in earnings.

The null hypothesis for the market value of common stock test can be rejected at the .002 level of significance. The negative value of the z-score supports the notion that forecast firms are systematically larger than non-forecast firms.

SUMMARY AND CONCLUSION

Two of the three research hypotheses were confirmed. The coefficient of variation in earnings, a surrogate for earnings variability, was found to be significantly lower for forecast firms. The test for the market value of common stock, a firm size surrogate, was also significant, supporting the notion that forecast firms are systematically larger than non-forecast firms. The results for the systematic market risk test, after controlling for earnings variability, found no significant difference between forecast and non-forecast firms.

The variables studied were selected on the basis of their potential ability to influence forecast accuracy (earnings variability and systematic market risk) and the information content (firm size) in management's forecasts. To the extent that earnings variability and firm size influence forecast accuracy and information content, the results reported in this study suggest that the accuracy and information content of voluntarily disclosed forecasts may not be representative of the accuracy and information content of the forecasts of currently non-disclosing firms if forecasts for these firms become required.

The current study extended and improved the work of Imhoff [1978] by investigating firm size as a differencing variable and using an experimental design which controlled for interdependencies between test variables. Also, contrary to the findings of Imhoff, the results of the beta tests reported in this study were in congruence with earlier research efforts which have reported positive relationships between beta and earnings variability.

In conclusion, the differences reported in this study between forecast and nonforecast firms may have important implications for the expected societal benefits of mandatory earnings forecasts and need to be considered in the formation of a reasonable disclosure policy.

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THE ACCOUNTING REVIEW
Vol. LX, No. 4
October 1985

International Variations in Perceptions of Accounting Journals

Christopher W. Nobes

ABSTRACT: The study on perceptions of quality of accounting journals by Howard and Nikolai [1983] is extended to include respondents from the U.K., Australia, and New Zealand. There are highly significant correlations between the perceptions of faculty in these three countries. There is also a high correlation with the earlier U.S. study, though the ranking of a few journals is markedly different.

HOWARD and Nikolai (HN) [1983] reported on the perceived ranking of the quality of journals by a sample of U.S. faculty. This paper extends the survey to three further nations: the U.K., Australia, and New Zealand.

METHOD

A questionnaire similar to HN's was used, except that the benchmark journal was THE ACCOUNTING REVIEW,[1] given a score of "100." Thirty-seven journals were included in the questionnaire, 23 from the HN survey[2] and 14 additional journals that tend to have more recognition outside the U.S.

The population surveyed was full-time faculty in permanent posts in universities.[3] There were 571 members of the population, *all* of whom were sent questionnaires. The usable response rate was 41 percent (see Table 1). This is broadly comparable to the U.S. *sample* size and number of usable responses. For the U.K. the responses were split into "accounting" and "finance" groups.[4]

RESULTS

Table 2 shows the 37 journals in rank order by geometric mean[5] for the three countries together. One journal (*The Journal of Accounting and Economics*)

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[1] It was necessary to use an internationally known journal, and *The Journal of Accountancy* (HN's benchmark) is not so widely known.

[2] Those eliminated included all the 22 lowest-ranked journals in HN, mostly professional journals, and six other journals regarded as likely to be less important internationally.

[3] The departmental lists of universities were supplied by the British Accounting Association and the Accounting Association of Australia and New Zealand. A further number of institutions might have been regarded as "universities" if they were in the U.S.; on the other hand, most of the present survey population did not have Ph.D.s, partly due to a different tradition from the U.S.

[4] The U.K. was the largest group, and the only one for which the source data already contained information to enable such a split.

[5] A very few scores were zero; these were treated as "1" for the calculation of geometric means. The rankings are very similar if arithmetic means are used.

The author gratefully acknowledges data processing assistance of Carolyn Girvan, and the useful comments of R. H. Parker and W. M. McInnes on an earlier draft.

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Manuscript received November 1984.
Revision received March 1985.
Accepted March 1985.

TABLE 1
SURVEY SIZE AND RESPONSE RATE

	Population	*Usable Responses*	*Percent*
U.K.	301	123	41
Australia	188	79	42
N.Z.	82	30	36
	571	232	41

was specifically mentioned by HN as a possibly unfortunate omission from their survey; this is seen to score highly for all the populations. There is great similarity between the perceptions of the survey populations. This is confirmed by high Spearman rank correlation coefficients; for example, that between the U.K. and Australian perceptions is 0.91.[6] The correlation coefficient between U.K. (accounting) and U.K. (finance) was 0.95, suggesting that lack of homogeneity of faculty in departments may not seriously affect the international comparisons. All these coefficients are significant at the 0.1 percent level.

Table 3 shows the rank orders of the 23 journals that were common to the present survey and to HN. There is a considerable degree of correlation: the Spearman coefficient is 0.75 between HN and the total of the three countries. The correlations of any of the four individual populations with HN are all close to this and are significant at the 0.1 percent level.

However, non-U.S. academics regard non-U.S. journals more highly than U.S. academics do; the average rank of non-U.S. academic journals was 12 for HN but 7.5 for the other three countries. Also, for particular journals there are noticeable differences between HN and any or all of the non-U.S. populations. The three journals of substantially greater appeal to Americans (*Harvard Business Review, Journal of Taxation, Journal of Accountancy*) tend to concentrate on technical or professional U.S. matters. The four journals held in much higher regard by non-Americans (*Abacus, Accounting and Business Research, International Journal of Accounting, Accounting Historians Journal*) are all academic journals, but ones that do not specialize in "empirical" or mathematically-based research; *Abacus* and *Accounting and Business Research* contain many financial reporting/law articles which would be of little importance in the different institutional context of the U.S., and all four journals contain history and international articles.

SUMMARY

There is a very high correlation between the perceptions of accounting academicians in the U.K., Australia, and New Zealand. There is a lower, but still highly significant, correlation between perceptions in these countries and those reported for the U.S. by HN. However, a few journals stand out as being perceived differently in the U.S. compared to the other countries.

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[6] Nearly half the squared differences in ranks in this case were caused by different perceptions of one journal: *The British Tax Review*.

TABLE 2

JOURNALS RANKED BY GEOMETRIC MEAN FOR TOTAL SURVEY

Journal	Three Countries			U.K. Acctg.		U.K. Fin.		Australia		N.Z.	
	#obs	*SD*	*Mean*	*#obs*	*Mean*	*#obs*	*Mean*	*#obs*	*Mean*	*#obs*	*Mean*
Journal of Finance (JF)	162	35	104	74	102	22	128	52	100	14	97
Journal of Accounting Research (JAR)	204	23	103	88	102	21	108	70	108	25	91
ACCOUNTING REVIEW *(AR)*	232	0	100	99	100	24	100	79	100	30	100
Journal of Financial & Quant. Analysis (JFQA)	135	42	94	55	90	22	110	44	93	14	86
Journal of Accounting and Economics (JAE)	148	27	86	63	78	19	101	49	91	17	87
Journal of Business (JB)	123	28	84	47	76	20	107	43	83	13	83
Accounting, Organizations and Society (AOS)	191	28	82	90	84	19	62	61	81	21	94
Accounting and Business Research (ABR)	216	24	76	96	79	24	68	71	74	25	82
Abacus (AB)	211	23	75	87	77	21	69	75	74	28	80
Journal of Business Finance and Accounting (JBFA)	200	21	74	89	78	23	76	67	70	21	76
Decision Sciences (DS)	72	26	65	28	67	10	41	24	76	10	65
Journal of Accounting, Auditing, and Finance (JAAF)	107	25	65	46	63	8	54	39	70	14	71
Harvard Business Review (HBR)	190	26	63	76	68	24	53	67	58	23	79
International Journal of Accounting, Ed. and Res. (IJA)	141	22	63	66	65	11	42	47	64	17	69
Journal of International Business Studies (JIBS)	55	42	58	26	54	11	56	14	60	4	64
Accounting and Finance (AF)	136	22	57	29	54	7	35	75	73	25	55
Accounting Historians Journal (AHJ)	99	24	55	42	55	9	29	36	63	12	55
Journal of Business Research (JBR)	48	25	55	17	51	9	52	16	56	6	73
Financial Analysts Journal (FAJ)	135	24	55	54	55	22	55	42	53	17	60
Journal of Accountancy (JA)	171	22	50	72	47	13	36	60	56	26	57
Journal of Business Law (JBL)	50	25	48	27	51	7	38	14	50	2	32
British Tax Review (BTR)	64	35	41	40	58	9	31	14	25	1	1
Internal Auditor (IA)	60	24	39	20	38	5	18	27	44	8	51
Management Accounting (MA)	136	23	38	83	30	21	19	46	37	16	53
National Tax Journal (NTJ)	47	32	37	20	46	8	51	17	30	2	6
Journal of Taxation (JT)	39	29	36	18	44	6	36	13	35	2	9
Accountancy (AC)	208	24	35	94	34	23	25	65	37	26	45
AUTA Review (AUTA)	130	24	34	90	37	22	25	16	28	2	40
CPA Journal (CPJA)	100	22	34	43	34	10	25	33	34	14	43
Accountant's Magazine (AM)	182	24	32	89	34	18	17	52	35	23	35
CA Magazine (CAM)	134	22	32	49	33	7	17	52	30	26	41
Management Accounting (MA)	166	22	32	60	36	14	28	45	40	17	49
Chartered Accountant in Australia (CAA)	145	24	30	40	31	6	18	75	30	24	34
Australian Accountant (AACCT)	151	24	28	38	31	6	17	78	25	29	40
Accountants' Journal (AJ)	133	22	27	35	23	10	24	59	27	29	32
Accountant (ACCT)	188	21	25	85	21	22	19	60	30	21	34
Certified Accountant (CACCT)	147	20	23	83	23	16	15	34	24	14	29

TABLE 3

COMPARATIVE RANK ORDERS OF GEOMETRIC MEANS

	HN	*U.K. (Accounting)*	*Total (3 Countries)*
JAR	1	2	2
AR	2	3	3
JF	3	1	1
JFQA	4	4	4
JB	5	9	5
HBR	6	10	12
DS	7	11	11
AOS*	8	5	6
JBFA*	9	7	9
JT†	10	19	21
JA†	11	17	17
FAJ†	12	15	15
AB*	13	8	8
JAAF	14	13	10
JBR	15	16	14
NTJ†	16	18	20
MA†	17	21	19
ABR*	18	6	7
IJA	19	12	13
CPAJ†	20	23	23
IA†	21	20	18
AC*†	22	22	22
AHJ	23	14	16

* Non-U.S. journal

† Tax or professional journal

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THE ACCOUNTING REVIEW
Vol. LX, No. 4
October 1985

COMMENTS

The Information Content of General Price Level Adjusted Earnings: A Comment

Bruce A. Samuelson and Brock Murdoch

ABSTRACT: Baran, Lakonishok, and Ofer [1980] present some empirical evidence on the information content of general price-level adjusted (GPL) earnings relative to historical cost (HC) earnings. Their statistical tests are shown to be invalid, thus leaving unsupported their main conclusion—GPL earnings are superior. We apply an appropriate statistical test to their data and find contrasting results: GPL betas exhibit significantly better correlation with market betas than do HC betas for market value-denominated betas, but *not* for a non-market-denominated beta. No conclusion can be rendered on the information content of GPL earnings, and the controversy over accounting beta construction is rejoined.

BARAN, Lakonishok, and Ofer [1980] (hereafter BLO) present some findings regarding the information content of inflation-adjusted earnings. We review their research and apply a more appropriate statistical test to their published data. Our results indicate that their main conclusion cannot be unambiguously supported. Further, no conclusion can be rendered on their remaining hypotheses until new tests are performed. Our contrasting results indicate that methodological enhancements may be necessary in research which employs an accounting beta based on a market value deflator, i.e., net income divided by the market value of common equity. This note seeks to qualify BLO's results because such findings might influence decisions of the Financial Accounting Standards Board and redirect attention to the unresolved controversy over the construction of the accounting beta for market research (see Gonedes [1973] and Beaver and Manegold [1975]).

THE BLO STUDY

BLO "explore the extent to which price-level adjusted data contain information not included in the historical-cost data currently provided" [p. 22]. They explore information content by measuring "the degree of association between the signals each procedure produces and the systematic risk of equity securities" [p. 22]. General price-level (GPL) and historical cost (HC) accounting betas are

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Manuscript received February 1983.
Revision received October 1984.
Accepted January 1985.

correlated with security beta. BLO cite Beaver and Manegold [1975] to support the notion that the accounting beta "is an important explanatory variable of the market beta" [p. 23].

BLO's main hypothesis is that "a higher correlation between GPL adjusted *betas* and market *betas* will indicate the superior information content that adjusted earnings contain over historical earnings . . ." [p. 32]. They apply a binomial test to the number of cases in which the GPL correlation coefficient exceeds the HC coefficient. Their null hypothesis (equal proportion) is rejected at an extremely high significance level: 0.000023. They conclude that "[t]he association between market *betas* and GPL adjusted *betas* was significantly *higher* [emphasis added] than those observed between market and historical-cost *betas*" [p. 34].

In a second conclusion, BLO assert "that investors adjust the earnings reported to them and do not make decisions based solely on reported data" [p. 32]. This assertion is again based on the proportion of cases in which the larger correlation coefficient occurs for a modified earnings variable (net income plus depreciation) rather than unmodified earnings (net income). BLO offer additional assertions and conclusions which will not be discussed individually since their evidential support arises from comparisons of the *frequency* of occurrence while BLO are attempting to provide evidence for a significant *difference* between coefficients.

BLO's METHOD

BLO present a "total of 108 (3 periods × 3 definitions of earnings × 2 types of adjustments × 2 accounting data sets × 3 types of portfolios) Spearman and product moment correlation coefficients . . ." [p. 30]. The 108 coefficients are used by BLO as independent random observations (cases) for the proportion tested in a binomial model. For example, BLO compare the number of times the GPL coefficient exceeds the HC coefficient to support their primary hypothesis that GPL earnings information has superior content to HC earnings information; they use the count (42 of 54 cases) in a binomial test to reject the hypothesis of equal performance.

One condition underlying the binomial test is the independence of each observation [Chou, 1975]. Clearly, the 108 observations are not independent. Each coefficient is computed from the correlation of the earnings beta and the security beta of 242 firms. BLO expand the number of coefficients from two (i.e., GPL and HC) to 108 by creating three time periods from one, by employing three earnings ratios from common components, by doubling the data with Bayesian weights, and by partitioning the total set of firms into two additional portfolios. The same data are recombined in these machinations but are not made independent. For example, three time periods are made from one by dividing the total period (18 years) into a first half and a second half (nine years each). Coefficients of the total period are not independent of the coefficients of either half-period. In addition, first-half and second-half coefficients may not be independent since HC income has a significant time-series correlation to itself. The three earnings ratios—net income to common equity (NI/CE), net income to the market value of common equity (NI/MV), and net income plus depreciation to market value of common equity (NI + Depr)/MV—use overlapping components. Financial ratio pattern studies have found that ratios using net income cluster with those using net income plus depreciation [Pinches, Mingo, and Caruthers, 1973; Pinches, et al., 1975;

Gombola and Ketz, 1983]. BLO do not provide evidence for the independence of their earnings ratios, the betas generated from the earnings ratios, or the correlation coefficients generated by the betas. In short, BLO cannot logically use binomial tests or comparative counts among the 108 cases as evidence for their assertions. They provide no direct test that GPL and HC correlation coefficients differ significantly.

AN ALTERNATIVE TEST

BLO could evaluate their hypotheses by testing the correlation coefficients for a significant difference. A significantly larger coefficient may be interpreted as exhibiting greater explanatory power of stock price movement. We provide a direct test of differences in their coefficients.

Williams [1959] provides a statistic for testing whether correlation coefficients differ significantly. A formula which is equivalent to Williams' statistic [1959, p. 79] is computed as follows:

$$t=\sqrt{\frac{r_1^2+r_2^2-2r_1r_2}{\dfrac{2(1-((r_1^2+r_2^2-2r_1r_2r_{12})/(1-r_{12}^2)))(1-r_{12})}{n-3}+\dfrac{(r_1^2+r_2^2+2r_1r_2)(1-r_{12})^3}{4(n-1)(1+r_{12})}}}$$

where

r_1 = correlation coefficient between the dependent variable and the first independent variable,

r_2 = correlation coefficient between the dependent variable and the second independent variable,

r_{12} = correlation coefficient between the two independent variables, and

n = the number of paired observations in the sample.

Fortunately, BLO publish sufficient data to use Williams' statistic on their main hypothesis. While BLO do not state their reasons for computing both Spearman rank and product-moment correlations, it is ostensibly because the underlying distribution of the data is unknown. Williams' statistic is a parametric test; it assumes the underlying data (here betas) are normally distributed. We assume normality, but we have no direct knowledge of this without testing BLO's data which are unavailable. We test only the product-moment correlations provided by BLO.

Table 1 displays the *t*-values computed for the difference between GPL and HC correlation coefficients for each of the three earnings ratios across all firms and two sizes of portfolios for the 18-year period without Bayesian adjustment. (Bayesian-adjusted results were almost identical to the non-adjusted results.) A one-tail test was used; approximate levels of significance are shown in parentheses.

ALTERNATIVE TEST RESULTS

The test results foster more ambiguity than clarity. The results show no significant difference in the correlation coefficients of GPL data versus HC data for the NI/CE earnings ratio. This result is contrary to BLO's conclusion that all GPL

TABLE 1

DIFFERENCES BETWEEN GPL CORRELATIONS AND HC CORRELATIONS FOR THE TOTAL PERIOD

Earnings Ratio (No Bayes Adjustment)	*Individual Security t-values (n=242)*	*Portfolios of 5 t-values (n=48)*	*Portfolios of 10 t-values (n=24)*
NI/CE	0.344 (.365)*	0.090 (.470)	0.157 (.438)
NI/MV	1.975 (.024)	1.942 (.026)	2.172 (.021)
(NI + Depr)/MV	4.479 (.0001)	2.724 (.005)	2.754 (.006)

* The number in parentheses is the significance level.

betas were higher than HC betas. GPL betas did, however, exhibit a significantly different and higher correlation (*vis-a-vis* HC betas) on both the NI/MV and the (NI + Depr)/MV earnings ratios, consistent with BLO's general conclusion.

These contrasting results redirect attention to methodology. The *non-significant* correlational difference arose with a *non-market value* based earnings deflator, while *significant* differences arose with both *market value* based earnings deflators. The significant differences observed here may not be the effect of GPL versus HC data, but the result of unexplained interactions. That is, information content is not enhanced by making GPL adjustments on the NI/CE ratio, but information content *appears* to be enhanced by making GPL adjustments on the NI/MV and the (NI + Depr)/MV ratios. The interaction of the GPL adjustments with the MV and/or Depr components of the latter ratios is causing the change in significance. Whether such interaction is enhancing information content or is causing spurious correlation (see Gonedes [1973]) is not clear.

CONCLUSION

Neither BLO's study nor our subsequent tests provide evidence to show that GPL earnings possess information content that is superior or inferior to HC earnings. BLO failed to exercise a valid test of their data; the binomial test did not use independent observations. Their raw data provide only anecdotal support for their assertions. When part of their data was subjected to a valid test, the results were contrasting. HC and GPL betas did not differ significantly for one earnings variable, but did for two additional earnings variables. These results stymie any general conclusions. Methodological enhancements may be necessary before valid conclusions can be reached on the information content of general price-level adjusted earnings.

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THE ACCOUNTING REVIEW
Vol. LX, No. 4
October 1985

The Information Content of General Price Level Earnings: A Reply

Josef Lakonishok and Aharon R. Ofer

We are indeed pleased (if not surprised) that according to Samuelson and Murdoch [1985] (hereafter SM) our paper may have had an important impact on the decisions of the Financial Accounting Standards Board (FASB). However, in their zeal to protect the FASB from misguided decisions, the authors have made some misleading statements and unwarranted conclusions. Contrary to their contention, the only valid point made in their comment strengthens the conclusions of our paper.

SM are correct in their criticism of our use of a binomial test in which we compare the number of cases in which the General Price Level (GPL) correlation coefficients exceed the historical cost (HC) coefficients. The problem with our test is that the observations are not independent. But we used the test more as a descriptive statistic and the conclusions do not depend on this particular test. Our results are summarized in the last section of the paper:

> For the total 18-year period examined, the GPL adjusted *betas* outperformed the historical-cost *betas* in every single comparison made. This was true across the three earnings definitions, the two *beta* specifications (Bayesian and non-Bayesian), and the three portfolio sizes. Similarly, conclusive results were found for the second sub-period which was characterized by a relatively high inflation rate. No such definite statements could be made regarding the results obtained for the first sub-period. This, however, could be attributed to the inflation prevailing during the first sub-period, which might have been too negligible to be incorporated into investors' decisions [Baran, Lakonishok and Ofer, 1980, p. 34]

These results clearly indicate that, in the tests that we conducted, GPL earnings outperformed HC earnings. If anything, the valid statistical test suggested by SM only strengthens our conclusions.

In Table 1 of the comment, the authors present results for the difference between GPL correlations and HC correlations using a statistical test provided by Williams [1959]. Based on the results in this table, the conclusions of our paper are criticized. The test is performed for three earnings ratios—net income to common equity (NI/CE), net income to market value of common equity (NI/MV), and net income plus depreciation to market value of common equity (NI+Depr)/MV. In addition, the test is performed for three portfolio sizes—indi-

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vidual securities, portfolios of five securities, and portfolios of ten securities. The results for two out of the three earnings definitions, NI/MV and (NI + Depr) /MV, reveal that GPL earnings outperform HC earnings at the five percent significance level. For NI/CE, GPL earnings outperform HC earnings but the difference is not statistically significant and the range of *t*-values is from .090 to .344, depending on the number of securities in the portfolio.

We have two specific problems with the conclusions presented in the comment. First, in our paper we present results with and without a Bayesian adjustment procedure to compute market and accounting betas. Our analysis clearly shows that the Bayesian adjustment procedure improves the results. In their Table 1, SM choose to provide results without a Bayesian adjustment. They claim, "Bayesian adjusted results were almost identical to the non-adjusted results" (p. 708). It is true that performing the Bayesian adjustment will not change our conclusions with respect to NI/MV and (NI + Depr)/MV (GPL outperforms HC). However, the Bayesian adjustment improves the performance of GPL adjusted NI/CE relative to the HC ratio. According to our computations using the Williams test, the range of *t*-values is 1.05–1.18. Although it is not significant at the five percent level, it is significant at the 15 percent level for a one-tailed test. Given that SM attack our conclusion based on the results with respect to NI/CE, we think that it is unfair and misleading to present results without Bayesian adjustment and to claim that the Bayesian-adjusted results are almost identical.

Second, even though the results based on the test by Williams show that for the two earning ratios, NI/MV and (NI + Depr)/MV, GPL earnings perform significantly better than HC earnings, SM seem to discount heavily these results:

> The *non-significant* correlational difference arose with a *non-market value* based earnings deflator, while significant differences arose with both *market value* based earnings deflators. The significant differences observed here may not be the effect of GPL versus HC data, but the result of unexplained interactions . . . Whether such interaction is enhancing information content or is causing spurious correlation (see Gonedes [1973]) is not clear [Samuelson and Murdoch, p. 709.].

Because the problem of spurious correlation is pivotal in SM's arguments, we will try to clarify it. The issue of spurious correlation in this particular context is discussed by Lev and Sunder [1979, p. 200]:

> Misconceptions about the nature of 'spurious correlation' are exemplified by the argument raised by Gonedes (1973a) with regard to the Beaver et al. (1970) results showing significant correlation between the market and accounting betas. Since Gonedes did not find the significant correlations reported by the earlier study, he reasoned that the higher correlations obtained by Beaver et al. can be 'spurious' due to the use of market value of equity as the scaling factor in that study. This use of the term 'spurious correlation' was quite different from the specific problems analyzed by Pearson [1897] and Kuh and Meyer [1955] as we have already discussed. The mere fact that two variables whose correlations are under scrutiny are functions of a third variable is no basis to declare the observed phenomenon spurious.
>
> The fundamental issue in using ratios with the same or correlated denominators is therefore not one of spurious correlation but rather of model specification . . . Thus, instead of being concerned with spurious correlation, one should pay careful attention to model

> formulation in the light of theoretical and statistical considerations at hand."

Although our theoretical understanding is far from being complete, the ratios deflated by market value are not less appealing. On the contrary, market value of equity is theoretically a better measure of shareholders' investment than the common equity that appears in financial statements. In addition, the standard statistical discussion of spurious correlation refers to a correlation between two deflated variables. The setting in our study is much more complicated; the deflated accounting returns are regressed on a market portfolio of accounting returns, and the returns of individual companies are regressed on a market portfolio return and only then are the correlations of two betas calculated. It is not clear that a problem of spurious correlation arises in such a setting.

In summary, SM suggest an important statistical test that we were not aware of when we wrote our paper. However, performing this statistical test does not change our conclusions. For all three earnings definitions, GPL earnings outperformed HC earnings. For two of the definitions (which we think are more appropriate), the results were statistically significant at the five percent level and for the third definition, the results were significant at the 15 percent level. Moreover, our data clearly indicate that the performance of GPL earnings improved substantially in the second sub-period which was characterized by a much higher inflation rate (the inflation rate during the first sub-period was negligible—1.7 percent per year). This also serves as an indication of the superiority of GPL earnings in an inflationary environment.

Very seldom do we find empirical results in accounting and finance that are unambiguous. We consider the results of our paper to be relatively strong.

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THE ACCOUNTING REVIEW
Vol. LX, No. 4
October 1985

EDUCATION RESEARCH

Jack E. Kiger, Editor

Sampling Risks and Audit Consequences Under Alternative Testing Approaches

Paul J. Beck and Ira Solomon

ABSTRACT: This paper investigates the relationship between sampling risks and audit consequences under error and audit value projection testing approaches. The latter approach typically is presented in auditing textbooks in connection with classical variables sampling, while the former approach is shown to underlie both dollar-unit sampling methods (in which an upper precision limit for monetary error is computed) and statistical compliance testing methods. In particular, we demonstrate analytically that error projection approaches implicitly test null hypotheses which effectively are equivalent to an alternative hypothesis underlying audit value projection. We also present outcome matrices to identify the effect of such hypothesis interchange on the audit consequences of sampling risks, and thus provide a basis for clarifying sampling risk discussions in textbooks and the recently issued *Audit and Accounting Guide: Audit Sampling.*

RECENTLY issued AICPA publications (*Statement on Auditing Standards (SAS) No. 39* [AICPA, 1981] and *Audit and Accounting Guide: Audit Sampling* (AGAS) [AICPA, 1982]) already have had a significant effect on the pedagogy of audit sampling. In particular, several statistical sampling presentations in audit textbooks have been revised to reflect the sampling framework presented in these publications.[1] Two important features of this framework are: (1) the discussion of alternative statistical testing approaches for quantifying and controlling the risk of making incorrect inferences about accounts and transaction classes, and (2) the introduction of a new sampling terminology applicable to each testing approach.

One of the substantive testing approaches discussed in the AGAS involves

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[1] We reviewed the following auditing textbooks: Arens and Loebbecke [1981, 1984], Bailey [1979], Bailey [1981], Cook and Winkle [1984], Defliese, et al. [1984], Guy [1981], Hermanson, Loeb and Strawser [1983], Holmes and Burns [1979], Kell and Ziegler [1983], Meigs, Whittington and Meigs [1985], Ricchiute [1982], Robertson and Davis [1985], Stettler [1982], Taylor and Glezen [1982], and Thomas and Henke [1983].

We wish to acknowledge the financial assistance of the Touche Ross Foundation through their AID to Education Program.

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Manuscript received July 1984.
Revision received December 1984.
Accepted May 1985.

the projection of monetary error from the sample to the population, while another involves an analogous projection of the sample audit value. Both approaches are widely adopted in practice and, in concept, provide equally valid means of structuring statistical audit tests. There are, however, important differences between the underlying statistical methods used to control sampling risks under the two testing approaches. In particular, when conducting statistical substantive tests using the audit value projection (AVP) approach, as shown below, the auditor (implicitly) tests the null hypothesis that the account book value is fairly stated (see Elliott and Rogers [1972]). Hence, the auditor's primary concern when projecting audit values is incorrectly accepting a false null hypothesis which would result in the reporting of a misstated account balance (see SAS 47 [AICPA, 1983]). The probability of committing this type of inferential error, by statistical convention, is denoted by beta.[2] Alternatively, under the error value projection (EVP) approach, the null hypothesis being tested (implicitly) is that the account book value is misstated by an amount greater than tolerable error (see the discussion below or Roberts [1974]). Incorrect rejection of the latter null hypothesis has precisely the same audit consequences, however, as incorrect acceptance of the null hypothesis under the AVP testing approach. Accordingly, the auditor's primary concern under the EVP testing approach is to control alpha risk (i.e., probability of incorrectly rejecting a true null hypothesis) rather than beta risk.

The different hypothesis formulations and emphasis on alternative statistical risks under the EVP and AVP testing approaches have been sources of confusion within audit textbooks. A reconciliation of these approaches was published over a decade ago (see Roberts [1974]), but textbook sampling presentations continue to be somewhat confusing. The new SAS 39/AGAS sampling risk terminology represents another attempt to improve such presentations by focusing directly upon audit consequences, rather than on inferential errors related to the specific null hypothesis being tested. Even after adoption of the new terminology and the attendant focus on audit consequences, however, textbook presentations still are problematic in several respects. First, students continue to have difficulty relating audit sampling risks to traditional concepts of inferential risks (alpha and beta) presented in introductory statistics courses. Hence, students may not understand how the audit consequences described in SAS 39 and the AGAS are controlled statistically. A second, related problem is that audit textbooks do not identify the null hypothesis tested implicitly by dollar-unit sampling (DUS) methods and by the compliance testing EVP analogue (i.e., exception rate exceeds the tolerable rate). Students thus are unable to reconcile the statistical control of alpha risk when projecting monetary errors and exceptions with beta risk control under AVP.

A third shortcoming of many textbook discussions of traditional variables estimation is omission or incomplete discussion of the issue of *ex post* (to sampling) risk control when preliminary and sample variability estimates differ. Without suitable *ex post* modifications in these circumstances, the auditor's actual

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[2] By statistical convention, a Type I error arises when a true null hypothesis is incorrectly rejected and the probability of such an error is alpha risk (see Mood, Graybill and Boes [1974]). Similarly, a Type II error is defined to be the incorrect acceptance of a false null hypothesis and its probability is referred to as beta risk. Thus, alpha and beta risk, by statistical convention, are defined with respect to the null hypothesis being tested, irrespective of the nature of the null hypothesis.

FIGURE 1
SAS 39 AND AGAS OUTCOME MATRIX

	Actual State*	
Conclusion	$\lvert E\rvert \le m$	$\lvert E\rvert > m$
$\lvert E\rvert \le m$	Correct Conclusion	Incorrect Acceptance of the account book value or overreliance
$\lvert E\rvert > m$	Incorrect Rejection of the account book value or underreliance	Correct Conclusion

* E is the actual monetary error and m is the largest error which is tolerable.

sampling risk exposure will differ from planned levels (see Roberts [1978], Beck and Solomon [1985], and Duke, Neter and Leitch [1982]). Moreover, the specific audit consequences of such sampling risk differences and the circumstances under which *ex post* modifications are appropriate, as shown below, differ between testing approaches. No extant auditing text provides an adequate discussion of this distinction between the AVP and EVP testing approaches.

The remainder of this paper consists of three sections. In the second section, we demonstrate analytically that each of the testing approaches discussed by the AGAS in connection with substantive testing (i.e., AVP and EVP) can be expressed as hypothesis tests. In particular, the implicit null hypothesis tested under each approach is shown to be equivalent to an alternative hypothesis under the other testing approach. Audit outcome matrices then are presented to illustrate that inferential errors have different consequences under the EVP and AVP testing approaches. The AGAS and textbook substantive testing discussions of inferential risks subsequently are extended to recognize the audit consequences of differences between preliminary and sample estimates of variability. This extension demonstrates that the distinction between testing approaches has pedagogical as well as audit practice implications. The third section identifies the audit consequences of inferential errors under the compliance testing approach adopted by textbooks (AGAS) and demonstrates an isomorphism with EVP in substantive testing. The important parallel between compliance and substantive testing is thereby illustrated and the auditor's focus on beta risk under AVP is reconciled with the focus on alpha risk in compliance testing and EVP-based substantive testing. The fourth section presents concluding remarks.

SUBSTANTIVE TESTING

SAS No. 39 [AICPA, 1981, ¶26] requires that the auditor project sample results to the underlying population. The AGAS [AICPA, 1983, pp. 94–99], as noted above, describes two sample projection approaches and presents a new risk terminology applicable to each. Figure 1 presents the audit consequences associated with the four possible substantive testing outcomes, two of which are adverse. One such outcome is incorrect acceptance of the account book value (i.e., the sample supports the conclusion that the account book value is misstated by less than tolerable error (m) when the actual monetary error, E, expressed as an absolute value, exceeds m). A second adverse outcome is incorrect rejection of the account book value (i.e., the sample supports the conclusion that a fairly stated account book value is misstated by more than m when $E \leq m$). Audit effectiveness is compromised by the former outcome, while the latter outcome would result in unnecessary testing, thereby compromising audit efficiency.

Although the SAS 39 evaluation framework is equally applicable to EVP and AVP, the AGAS has equated beta risk with the risk of incorrect acceptance of the account book value. Similarly, alpha risk and the risk of incorrect rejection of the account book value also have been equated (see AICPA [1983, pp. 47, 127, 129]). When the EVP approach is employed (primarily in conjunction with DUS methods), however, these associations are incorrect since alpha (beta) risk, as shown below, represents the risk of incorrectly accepting (rejecting) the account book value.

In the ensuing subsection, we discuss the control of audit consequences under the EVP testing approach in the contexts of classical variables estimation and DUS. An analogous discussion of AVP with classical variables estimation then is presented in the second subsection. Finally, the third subsection explains how audit consequences can be controlled *ex post* to sampling under each testing approach.

Error Projection

When implementing the EVP testing approach in substantive testing based upon either classical variables estimation or DUS methods, the auditor constructs an upper precision limit (one-sided confidence interval) for the total monetary error in the underlying population of subsidiary account values (or transaction class). Such an error projection is comprised of the auditor's point estimate of monetary error (likely error) and an allowance for sampling risk (see AGAS [AICPA 1983]). Operationally, the allowance for sampling risk, computed under DUS methods, is based upon tabled values of either the binomial or poisson distributions. Alternatively, under classical variables estimation, the allowance is equal to the product of the sample standard error estimate ($\sigma/\sqrt{n}$) and a standard normal deviate (z-value). The projected error is:

$$|\hat{E}| + Z_{\alpha/2} \cdot \sigma/\sqrt{n} < m, \qquad (1)$$

where $\hat{E}$ is the sample estimate of likely monetary error, $Z_{\alpha/2} \cdot \sigma/\sqrt{n}$ is the allowance for sampling risk, and m is tolerable (monetary) error.[3]

Under the EVP testing approach, the auditor would conclude that the account book value is correctly stated only when the projected monetary error (likely error plus the allowance for sampling risk) is less than tolerable error.[4] This decision

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[3] The term, $\hat{E} = \hat{Y} - X$, where $\hat{Y}$ is the sample estimate of the true (audit) value and X is the unaudited account book value. Note that the point estimate $\hat{Y}$ and associated standard error could be computed using any of several estimators including ordinary mean-per-unit (MPU), stratified MPU, or auxiliary (difference, ratio, or regression).

[4] The upper precision limit for monetary error is constructed so that no more than $\alpha/2$ percent of the sample outcomes would exceed the bound assuming that the actual monetary error is less than or equal to the sample mean estimate. The bound also can be interpreted statistically as the $100 - \alpha/2$ percent fractile of the sampling distribution. Under the normality assumption, the $100 - \alpha/2$ percent fractile of the sampling distribution is determined statistically by adding the allowance for sampling risk ($Z_{\alpha/2} \cdot \sigma/\sqrt{n}$) to the (absolute value) of the mean estimate. For other assumed sampling distributions (e.g., binomial), the various fractile values can be

FIGURE 2
EVP TESTING APPROACH OUTCOME MATRIX

Conclusion	Actual State	
	$\|E\| \leq m$	$\|E\| > m$
$\|E\| \leq m$	Correct Conclusion	Type I error
$\|E\| > m$	Type II error	Correct Conclusion

rule was described previously in Appendix B to *Statement on Auditing Procedure (SAP) No. 54* [AICPA, 1972] and, as noted by Roberts [1974], effectively tests the null hypothesis that $|E| > m$. This point can be demonstrated by subtracting $Z_{\alpha/2} \cdot \sigma/\sqrt{n} + m$ from both sides of (1) and then dividing through by $\sigma/\sqrt{n}$. Thus, (1) is equivalent to the following:

$$\frac{|\hat{E}| - m}{\sigma/n} < -Z_{\alpha/2}. \quad (2)$$

The left side of (2) can be recognized as a critical ratio which tests whether the absolute monetary error estimate is smaller than m at the $\alpha/2$ significance level. Accordingly, alpha risk is defined (and controlled) at the point where absolute monetary error is equal to tolerable error (i.e., the null hypothesis is true) and (2) is a test of the following hypotheses:[5]

$$H_0: |E| > m$$
$$H_a: |E| \leq m.$$

The specific audit consequences of inferential risks (alpha and beta) under the EVP testing approach are depicted in Figure 2. There are four possible audit outcomes associated with the auditor's use of this testing approach. If $|E| > m$, the auditor should accept H_0. Hence, rejection of H_0 (by convention, a Type I inferential error) would result in the erroneous conclusion that the account book value is fairly stated. In such circumstances, audit effectiveness would be compromised. Alternatively, if $|E| \leq m$, acceptance of H_0 (by convention, a Type II inferential error) would result in the erroneous conclusion that the auditee's account book value is misstated, thereby compromising audit efficiency. Alpha and beta risks, under the EVP testing approach, therefore, are related to the effectiveness and efficiency of the audit, respectively.

Many recently revised audit textbooks incorporate DUS methods in substantive testing. The auditor typically tests for overstatement errors in asset accounts under DUS by computing an upper precision limit for monetary error (CUPL). Such a CUPL calculation is analogous to the calculation under the EVP approach as presented in (1), except that the allowance for sampling risk (implicit in the DUS CUPL) is based upon attribute sampling theory, rather than normal distribution theory. Since the auditor would conclude that the account book value is misstated when the projected monetary error exceeds tolerable error, these methods also implicitly test the null hypothesis that $|E| > m$ (see Teitlebaum

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determined numerically, or from standard tables such as those presented in auditing textbooks.

[5] Note that if likely error were larger than tolerable error (i.e., $\frac{|\hat{E}| - m}{\sigma/\sqrt{n}} > 0$), the auditor could not reject the above null hypothesis.

FIGURE 3
AVP TESTING APPROACH OUTCOME MATRIX

Conclusion	Actual State $\lvert E\rvert=0$	Actual State $\lvert E\rvert>0$
$\lvert E\rvert=0$	Correct Conclusion	Type II error
$\lvert E\rvert>0$	Type I error	Correct Conclusion

and Robinson [1975]). Consequently, the effectiveness of the audit is related to alpha risk while audit efficiency is related to beta risk.

The audit textbooks which we have reviewed neither identify the underlying hypothesis formulation nor explain why the statistical control of alpha risk is of primary concern when DUS methods are employed. The supplemental outcome matrices and associated discussion presented herein, therefore, should facilitate students' general understanding of these matters and, in concert with the discussion below, reconcile the emphasis on alpha risk under EVP in DUS with beta risk under AVP in classical variables estimation.

Audit Value Projection

An alternative means of evaluating account balances in substantive testing is to project audit values as described by Elliott and Rogers [1972] and discussed in the AGAS [1982, p. 95]. Under this testing approach, the auditor concludes that the account book value (X) is fairly stated when:

$$\hat{Y}-Z_{\alpha/2}\sigma/\sqrt{n}<X<\hat{Y}+Z_{\alpha/2}\sigma/\sqrt{n}, \quad (3)$$

where $\hat{Y}$ is the sample estimate of the actual population value and $Z_{\alpha/2}\sigma/\sqrt{n}$ is the allowance for sampling risk.

The inequality in (3) also can be expressed in terms of monetary error as noted by Elliott and Rogers [1972]. Subtracting X from the terms in (3), the two following equivalent inequalities are obtained:

$$0<\hat{Y}-X+Z_{\alpha/2}\sigma/\sqrt{n} \quad (4)$$

$$\text{and } \hat{Y}-X-Z_{\alpha/2}\sigma/\sqrt{n}<0. \quad (5)$$

Further, since $\hat{E}\equiv\hat{Y}-X$, one can verify that (4) is equivalent to the condition that

$$-Z_{\alpha/2}<\hat{E}/\sigma/\sqrt{n}, \quad (4A)$$

and (5) is equivalent to

$$\hat{E}/\sigma/\sqrt{n}<Z_{\alpha/2}. \quad (5A)$$

Finally, combining (4A) and (5A), the following inequality is obtained:

$$|\hat{E}|/\sigma/\sqrt{n}<Z_{\alpha/2}. \quad (6)$$

The critical ratio in (6) allows the auditor to determine whether the sample monetary error estimate (expressed as an absolute value) is significantly larger than zero at the $\alpha/2$ significance level. Consequently, in contrast with EVP, alpha risk is defined and controlled at the point where $|E|=0$ (see Duke, Neter, and Leitch [1982]), rather than where $|E|=m$. The AVP approach, thus, tests the following null and alternative hypotheses:

H_0: $|E|=0$, and

H_A: $|E|>0$.

The above null hypothesis can be recognized as a member of the set of alternative hypotheses under the EVP approach.

Similarly, the alternative hypothesis set above includes the null hypothesis that $|E| > m$ under EVP. Hence, the AVP approach effectively interchanges the null and alternative hypotheses under the EVP approach.

The association between inferential risks and audit consequences under the AVP testing approach is once again identified by means of an outcome matrix (see Figure 3). When the absolute monetary error is not significantly different from zero (e.g., E is tolerable), H_0 should not be rejected. Thus, incorrect rejection of H_o (by convention, a Type I inferential error) would result in the conclusion that the account book value is misstated, and thereby compromise audit efficiency. Conversely, if the absolute monetary error is significantly greater than zero (e.g., E exceeds tolerable error), a Type II inferential error would be committed by failing to reject the false H_0, and thereby allowing a misstated account balance to be reported. Incorrect acceptance of H_0 (beta risk) under the AVP testing approach, therefore, has the same audit consequence as incorrect rejection of H_0 (alpha risk) under the EVP approach. Similarly, incorrect rejection of the H_0 under AVP has the same audit consequence as incorrect acceptance of H_0 under EVP.

Our classroom experience has shown that students' understanding of statistical audit sampling can be enhanced by identifying the null hypothesis implicitly tested and presenting outcome matrices to illustrate the relationship between inferential risks and audit consequences under EVP and AVP. In particular, we have demonstrated analytically why alpha risk should be emphasized when errors are projected and beta risk emphasized when audit values are projected. In addition to improving these aspects of audit sampling pedagogy, the analysis above has implications for the *ex post* (to sampling) control of audit risks which are discussed in the following subsection.

Ex Post to Sampling Risk Control

When classical variables sampling is employed, the auditor's sample size planning decision depends upon a preliminary estimate of the population variability.[6] Preliminary estimates are likely to differ from sample estimates, however, due to sampling error.[7] In such situations, the actual effectiveness and efficiency of the auditor's tests can differ from planned levels (see Roberts [1978] and Beck and Solomon [1985]).[8] For example, if the sample variability is greater than anticipated in planning the test, the AVP critical ratio in (6) would be smaller than planned, thereby reducing the auditor's statistical power to reject a false H_0. As a consequence, audit (effectiveness) risk would be elevated above the planned level. (If the sample variability were less than the preliminary estimate, a parallel analysis would indicate that audit risk would be lower than planned under the AVP approach.)

Similarly, if the sample variability were greater than anticipated, the EVP critical ratio in (2) also would be smaller than planned. While rejection of H_0 again would become more difficult, audit efficiency rather than effectiveness would be affected due to the different null hypothesis tested under EVP. (Conversely, if the sample variability were less than the preliminary estimate, audit effectiveness would be adversely affected under the EVP approach, because the critical ratio would be smaller than planned for a given $|\hat{E}|$ estimate.)

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[6] Such a preliminary estimate could be based upon a pilot sample, the variance of the unaudited account book values, or assessed subjectively by the auditor. If a difference estimator were employed, the preliminary variability estimate would be based upon the variance of the anticipated differences between the subsidiary book and audit values rather than the variance of the subsidiary book values.

[7] The presence of misstated subsidiary accounts in the sample also could create differences between preliminary and sample estimates of the standard error. For example, standard error estimates for the auxiliary (difference, ratio, and regression) estimators are highly sensitive to the particular error pattern (see Beck [1980], and Duke, Neter, and Leitch [1982]).

[8] Similar problems also can arise under DUS when the sample error rate exceeds the error rate used to compute the required sample size.

The above analysis explains why, in the absence of *ex post* modifications, differences between preliminary and sample variability estimates have the opposite audit consequences under the EVP and AVP testing approaches. Hence, the analysis also implies that *ex post* sampling modifications to control audit (effectiveness) risk are required in the opposite circumstances under each testing approach. Specifically, Roberts [1978] suggested reducing the z-value under the AVP testing approach when the sample variability estimate exceeds the preliminary estimate, so that the actual sampling risk allowance would equal the planned allowance. Under EVP, however, our analysis indicates that the z-value should be increased when the sample variability estimate is less than the preliminary variability estimate.

COMPLIANCE TESTING

Statistical compliance tests can be conducted by projecting either a compliance rate or an exception rate (analogous to the AVP and EVP approaches in substantive testing, respectively). Both the AGAS and auditing textbooks, however, only present the latter approach whereby controls are evaluated by comparing an upper precision limit based on the sample exception rate, with a tolerable rate.[9] Furthermore, the AGAS and recently revised textbooks have equated alpha and beta risks with underreliance and overreliance, respectively, which, as shown below, incorrectly suggests that the auditor's compliance testing focus should be on beta risk.

When projecting exception rates, the upper precision limit, in concept, could be determined from the formula presented in (1). In practice, however, the normality assumption which underlies the calculation of the allowance for sampling risk in (1) probably would not be satisfied given the relatively low exception rates required for reliance on internal control. Practicing auditors and auditing textbooks in compliance testing, therefore, usually rely upon the binomial rather than the normal distribution to compute an allowance for sampling risk. Thus, operationally, the upper precision limit would be taken directly from tabled values of the binomial distribution (see fn. 4) and the following decision rule would be employed: conclude that the controls are unreliable when the upper precision limit exceeds the tolerable rate, m. Such a decision rule, in which the upper precision limit is compared with m, effectively tests the following null and alternative hypotheses:

H_0: the exception rate, $E > m$.

H_a: the exception rate, $E \leq m$.

The consequences of inferential errors

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[9] Compliance rate projection, which would be the compliance testing analogue to the AVP testing approach, could be operationalized by testing the following hypotheses:

H_0: the internal control is effective (i.e., the exception rate, $E=0$), and

H_a: the internal control is not effective (i.e., the exception rate, $E>m$),

where m denotes the tolerable exception rate. Bailey [1981] has shown that, under the normality assumption, this hypothesis formulation would be tested using the same critical ratio in (6) with E now representing the exception rate. Further, under this testing approach alpha (beta) risk would be associated with audit efficiency (effectiveness), as in the AVP substantive testing approach.

in compliance testing under exception rate projection are conveniently analyzed by reference to outcome matrices. Figure 2, for example, can be reinterpreted to depict the outcomes associated with the auditor's decision to rely (or not rely) on the control(s) and the two hypothesized states of nature. Assuming that $E>m$, incorrect rejection of H_0 (alpha risk) would result in unwarranted reliance on internal controls (or overreliance in SAS 39/AGAS terminology; see Figure 1). Alternatively, if $E \leq m$, incorrect acceptance of H_0 (beta risk) would result in inadequate reliance on internal controls (or underreliance in SAS 39/AGAS terminology; see Figure 1). The compliance testing consequences of alpha and beta risks under exception rate projection, therefore, are analogous to those under EVP in substantive testing in that alpha and beta risks are related to audit effectiveness and efficiency, respectively.

CONCLUDING REMARKS

In this paper, we identified and discussed the relationship between inferential errors and audit consequences under alternative statistical testing approaches, and thereby corrected both the AGAS and audit textbooks which have adopted the AGAS terminology. Audit outcome matrices also were presented as pedagogical supplements to illustrate that, due to the effective null hypothesis interchange, control of audit (effectiveness) risk requires a focus on beta risk when using AVP or compliance rate projection approaches, but alpha risk when either EVP or exception rate projection approaches are employed.

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THE ACCOUNTING REVIEW
Vol. LX, No. 4
October 1985

Within-Person Expectancy Theory Predictions of Accounting Students' Motivation to Achieve Academic Success

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ABSTRACT: This paper presents evidence to support the proposal that the force model of expectancy theory [Vroom, 1964] provides a useful conceptual framework for understanding a student's motivation to strive for academic success. Previous research examining this issue has employed the methodologically-flawed across-persons approach. Using the within-persons decision modeling approach [Stahl and Harrell, 1981], the study results indicate: (1) force model predictions of student motivation are very accurate ($R=0.85$); (2) increases in the value of expectancy result in declining marginal increases in a student's motivation; and (3) a student's motivation to strive for academic success is positively correlated with the student's actual behavior (academic performance). The results have implications for the grading and other policies of accounting educators who seek to establish a learning environment which fosters high student motivation.

Most accounting educators would agree that a professor's policy for awarding grades can influence a student's motivation to learn. Some disagreement exists, however, as to how particular grading policies affect a student's motivation. Some, for example, maintain that a very liberal policy for awarding grades encourages students and hence increases their motivation to learn, while others maintain that a very conservative policy for awarding grades provides students with a difficult challenge and hence increases their motivation to learn. Other aspects of a professor's grading policy may also influence a student's motivation. Since important material is often presented in the final few weeks of an accounting course, it seems apparent that students should be encouraged to put forth a high level of effort towards the end of a course as well at the beginning. Is it possible for an accounting professor's grading policy to structure the learning environment to encourage a high level of student motivation throughout the term?

Although most accounting educators readily acknowledge the importance of motivating their students, relatively little research by accounting faculty has focused upon student motivation. With this in mind, a primary purpose of this paper is to propose that Vroom's [1964] force model of expectancy theory can provide accounting educators a useful conceptual framework for understanding a student's

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Manuscript received July 1984.
Revision received February 1985.
Accepted May 1985.

motivation to strive for academic success. Although expectancy theory has been employed by a number of researchers in other disciplines to examine student motivation [Batlis and Waters, 1973; Smith, Ascough and Ettinger, 1976; Henson, 1976; Polczynski and Shirland, 1977], these previous studies employed the methodologically-flawed across-persons method, which produces unreliable results. This study presents the results of an empirical study that employed a within-persons method to examine the ability of the force model to predict a student's motivation to strive for academic success. In addition, evidence is provided which indicates a student's motivation to strive for academic success is related to the student's actual academic performance. The problem of motivating students to put forth their best efforts is, of course, faced by educators in all disciplines. Since, however, the subjects who participated in the empirical study described here were accounting students, the research findings should be of particular interest to accounting educators. With these issues in mind, let us briefly examine some key aspects of Vroom's [1964] expectancy theory of motivation.

EXPECTANCY THEORY OF MOTIVATION

The continuing popularity of expectancy theory [Vroom, 1964] is indicated by a series of nine literature reviews [Mitchell and Biglan, 1971; Heneman and Schwab, 1972; Wahba and House, 1974; House, Shapiro and Wahba, 1974; Mitchell, 1974; Locke, 1975; Connolly, 1976; Mitchell and Beach, 1977; and Mitchell, 1979] and a number of empirical research efforts [Kopelman, 1977; Arnold, 1981; Stahl and Harrell, 1981, 1983; Rynes and Lawler, 1983; Harrell and Stahl, 1984]. Vroom's [1964] original formulation of expectancy theory involved two models, the valence model and the force model. The valence model, which is not examined in this paper, predicts the valence, or attractiveness, of an outcome. In the force model, Vroom [1964] hypothesized that the motivational force acting on a person to perform an act is a monotonically increasing function of the sum of the products of the valences of all first-level outcomes and the expectancies that the act will be followed by the attainment of these outcomes.

Thus

$$F_i = \sum_{j=1}^{n} (E_{ij} V_j) \tag{1}$$

where F_i = the force to perform act i, E_{ij} = the expectancy or likelihood that act i will be followed by outcome j, and V_j = the valence of outcome j [Vroom, 1964, p. 18]. The force model implies that the motivational force upon an accounting student to achieve academic success (e.g., to earn a grade of "B") is explained by the attractiveness (valence) of performing well and the expectancy that a particular level of effort will result in performing well.

Conventional Research Approach

The conventional approach for examining the force model has involved an across-persons method. With this approach, a researcher typically obtains self-reports of the valences and expectancies that a particular group of subjects associates with an outcome of interest (e.g., earning a particular academic course grade, such as a "B"). These values are then combined in a multiplicative manner. The values resulting from this combination are then correlated with the subjects' self-reports of their motivation to pursue the outcome of interest (e.g., earning a "B"). This across-persons approach was used in a very large number of studies during the 15-year period following publication of Vroom's

[1964] book, with mixed results. Wahba and House [1974], for example, have noted that some studies have supported additive combinations, while some have supported the multiplicative combination described in Equation 1. Schwab, Olian-Gottlieb and Heneman [1979] noted that some studies that contained no assessment of expectancy in their motivational force measures had higher predictive powers than studies that did consider expectancy. In general, the force model provided relatively low predictive ability when the across-persons approach was involved. Mitchell [1974], for example, reviewed a large number of these studies and reported an average correlation of only .27 for the force model's predictions.

As mentioned earlier in this paper, studies by Batlis and Waters [1973], Smith, Ascough and Ettinger [1976], Henson [1976] and Polczynski and Shirland [1977] provide examples of research which employed the conventional across-persons approach in using the force model to examine the motivation of students. The conventional across-persons approach for examining the force model has been severely criticized on measurement and methodological grounds. Schmidt [1973], for example, pointed out that frequently-used Likert scales, when multiplied, may produce inconsistent tests of the theory, particularly if a correlational test is used. Kopelman [1977] has emphasized that the across-persons approach is not the correct method to be used in examining expectancy theory, as the theory is formulated on a within-persons basis. Wolf and Connolly [1981] objected to the across-persons approach more emphatically, stating: "The core objection to these between-subjects analyses, then, is that they have neither theoretical nor practical significance" [1981, p. 43]. The analysis methods used with the across-persons approach can mask variations within individuals; this means such studies lack internal validity, the essential element of any experimental study [Campbell and Stanley, 1963, p. 5].

Decision Modeling Research Approach

Responding to proposals made by Mitchell and Beach [1977] and Zedeck [1977], Stahl and Harrell [1981, 1983] recently demonstrated how decision modeling can be used for a within-persons examination of expectancy theory. This approach avoids the methodological and measurement difficulties experienced with the conventional across-persons approach previously used for expectancy theory research. In general, the use of decision modeling had previously been restricted almost entirely to the examination of cognitive human information processing issues (e.g., see Slovic and Lichtenstein [1971]; Kaplan and Schwartz [1975]; Slovic, Fischoff and Lichtenstein [1977]; Hammond, et al. [1977]; Libby [1981]; and Ashton [1982]).

The results of the recent expectancy theory research studies employing a within-persons decision modeling approach [Stahl and Harrell, 1981, 1983; Rynes and Lawler 1983; Harrell and Stahl, 1984] indicate that many persons employ additive processes rather than the multiplicative processes implied by the force model (Equation 1). Stahl and Harrell [1981] proposed a modification to the original force model to recognize these empirical findings. This conceptual issue might, however, be of relatively little interest to accounting educators, who instead are likely to be interested in the model's predictive ability. Recent studies indicate the predictive ability of the force model is very good when the within-persons approach is employed, with average multiple correlation coefficient values of about $R = 0.86$ being reported in a number of experiments [Stahl and Harrell, 1981; Harrell and Stahl, 1984].

RESEARCH HYPOTHESES

The research literature outlined above suggests the force model of expectancy theory can provide good predictions of a student's motivation to strive for academic success. Accordingly, the first hypothesis was formulated to examine this primary issue. Recent research by Rynes and Lawler [1983] suggests that increases in the value of expectancy result in marginally declining increases in the value of motivational force, so the second hypothesis was formulated to examine this issue. Since many persons believe a student's actual academic performance is influenced by the individual's motivation to succeed [Vroom, 1964], the third hypothesis was formulated to examine this issue. The three hypotheses are:

H1: The force model of expectancy theory provides accurate predictions of a student's motivation to strive for academic success.

H2: Within the framework of the force model of expectancy theory, increases in the value of expectancy result in declining marginal increases in the value of motivational force.

H3: A student's motivation to strive for academic success is positively correlated with the student's actual academic performance.

The first hypothesis (H1) implies that the predictive variables presented by Vroom [1964, p. 18] in the force model (i.e., the valence or attractiveness of academic success and the expectancy that effort will lead to achieving academic success) can be used to describe the important motivational aspects of a student's learning environment. The second hypothesis (H2) implies that an increase in the expectancy that effort leads to academic success results in a less than proportionate increase in a student's motivation to perform well. The third hypothesis (H3) examines the belief that the level of a student's motivation to achieve academic success influences the individual's actual academic performance. It should be noted that, since expectancy theory predicts an individual's motivation rather than the individual's actual performance, the third hypothesis is not based upon the force model. Let us next consider the empirical examination of the three hypotheses.

METHOD

The decision modeling method employed by Stahl and Harrell [1981], Rynes and Lawler [1983], and Harrell and Stahl [1984] was used to examine the three hypotheses. With this approach, the subject's effort-level decisions provide an operational measure of the level of motivational force acting upon the person to perform a particular act within a particular set of circumstances. A decision-making exercise composed of cases representing a number of hypothetical academic courses was used to gather the empirical data. The exercise was closely modeled after one of the exercises used by Stahl and Harrell [1981]. The three elements just above Decision A in Exhibit 1 correspond to the second-level outcomes described in Vroom's [1964] valence model, which has been examined by Stahl and Harrell [1983] using the decision modeling approach. The three outcomes, an improved grade-point ratio, increased esteem in the eyes of classmates, and a strong feeling of personal satisfaction, were initially identified as relevant outcomes by Stahl and Harrell [1981], who surveyed a sample of student subjects prior to the design of their exercise. Prior to this study, a small sample ($n = 10$)

EXHIBIT 1

SAMPLE CASE FROM THE DECISION-MAKING EXERCISE

If you receive a "B" in this course, the likelihood this will result in—

. . . an improved overall Grade Point Ratio (GPR) is	LOW (10%)*
. . . increased esteem in the eyes of your classmates is	HIGH (90%)
. . . a strong feeling of personal satisfaction is	LOW (10%)**

DECISION A. With the factors and likelihoods shown above in mind, indicate the attractiveness to you of receiving a "B" in this course.

−5	−4	−3	−2	−1	0	+1	+2	+3	+4	+5
Very Unattractive										Very Attractive

FURTHER INFORMATION. If you exert a great study effort during the remainder of this semester, the likelihood you will earn a "B" in this course is HIGH (90%).

DECISION B. With the attractiveness and likelihood information above in mind, indicate the study effort you will exert for this course during the remainder of this semester.

1	2	3	4	5	6	7	8	9	10	11
Low Effort					Average Effort					Great Effort

* It seems likely so much effort is required to earn a "B" in this course that doing so means your grades in other courses will suffer, resulting in no improvement to your overall Grade Point Ratio (GPR).

** Earning a "B" in this particular course is no indication of real accomplishment, therefore no feeling of personal satisfaction would result from doing so.

of accounting students was provided a list of the three outcomes and asked to indicate other equally or more important outcomes they associated with earning a "B" rather than a "C" in an accounting course. The responses they provided, for example, "good grades make me more employable," were judged to be highly correlated with one of the three initial outcomes. Accordingly, only the original three outcomes were used in the exercise. A sample case from the decision exercise is presented in Exhibit 1. In completing the exercise, the subjects, who were all undergraduates majoring in accounting, were asked to assume that about half of a 16-week semester had elapsed (which was actually true) and that each was currently earning a grade of "C" in each of the hypothetical courses presented in the exercise. The exercise was designed so each of the essential elements of the force model (see Equation 1) corresponded to an element of the exercise. Stahl and Harrell [1981, 1983] and Harrell and Stahl [1984] provide detailed discussions of the design of such an exercise which, for brevity, are not repeated here.

In arriving at Decision A in Exhibit 1, each student subject indicates the attractiveness (valence, V_j in Equation 1) of earning a "B" in the course. Following Decision A, likelihood information, which corresponds to E_{ij} in Equation 1, is presented. In arriving at Decision B in Exhibit 1, the student indicates the level of effort he or she intends to exert to earn a grade of "B" in the course. Accordingly, this effort-level decision reflects the level of the subject's motivation to strive for academic success (i.e., to earn a grade of "B" in the course) and provides an operational measure of motivational force, F_i in Equation 1. Since two levels (ten percent and 90 percent) were associated with each of the second-level out-

EXHIBIT 2

MEAN STANDARDIZED BETA-WEIGHT MEASUREMENTS OF THE VALENCE THE SUBJECTS ASSOCIATED WITH SECOND-LEVEL OUTCOMES FOR DECISION A

Second-Level Outcomes	*Beta-Weight*	*S.D.*
Improved overall Grade Point Ratio (GPR)	0.67	0.21
Increased esteem in the eyes of classmates	0.09	0.15
A strong feeling of personal satisfaction	0.46	0.20

comes related to Decision A and three levels (ten percent, 50 percent and 90 percent) were associated with the expectancy variable, each student participant completed 24 cases ($2 \times 2 \times 2 \times 3 = 24$). A factorial design was incorporated into the exercise, with the cases being presented in random order to avoid response biases. The advantages and disadvantages of using an exercise such as that described here to collect data have been discussed by Libby [1981, pp. 39–44].

Seventy-seven undergraduates majoring in accounting voluntarily participated in the study and completed the decision-making exercise. About 30 percent were females and all were in their junior year at the time the data were collected during a regular classroom session. Student identification numbers were provided by each subject to allow each individual's actual course grades in two semesters of intermediate accounting to be determined.

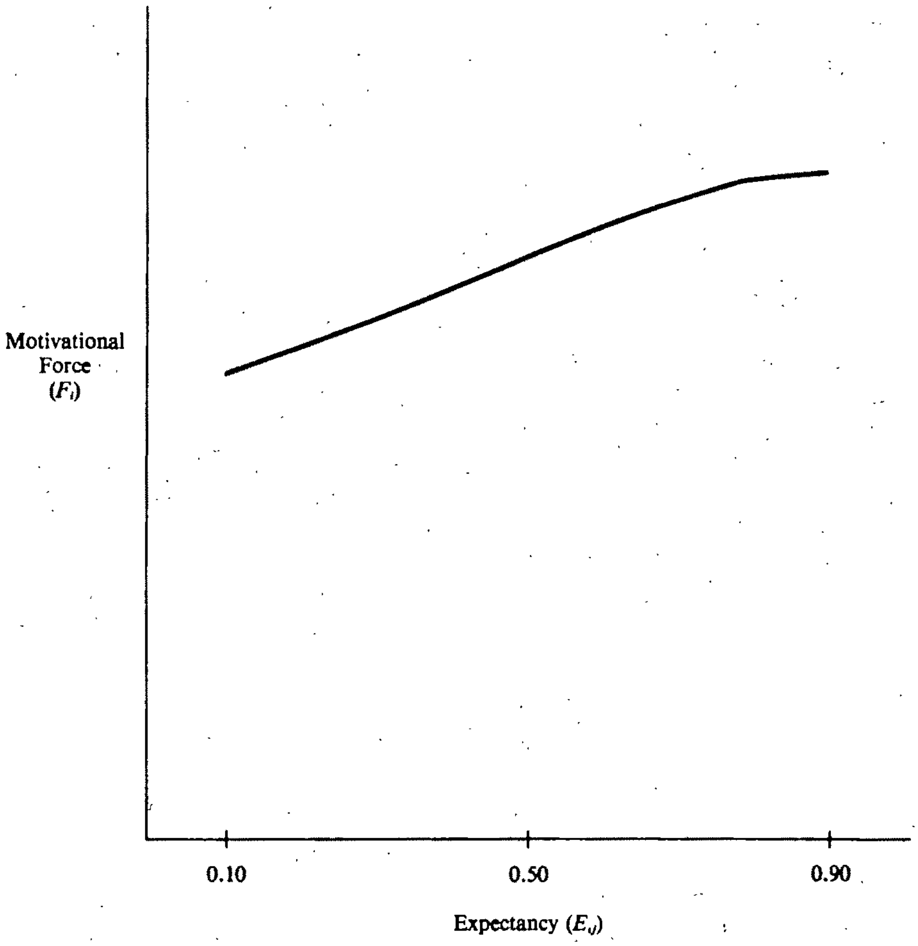
EXAMINATION OF HYPOTHESES

Since each subject's first-level outcome valence decisions (V_j in Equation 1; Decision A in Exhibit 1) are an important predictor variable in the force model, it is appropriate to consider how consistently the participants reacted to the manipulation of the second-level outcome instrumentalities (the three information items just above Decision A in Exhibit 1) before examining the research hypotheses. Accordingly, multiple regression analysis was used to examine the relationship between each subject's first-level outcome valence decisions and the three second-level outcomes, with Decision A serving as the dependent variable and the three second-level outcomes serving as the independent variables. A separate regression model was obtained for each subject to maintain the within-persons approach. All 77 subjects had statistically significant regression models, with $R = 0.85$ being the average individual multiple correlation coefficient. Stahl and Harrell [1983] have demonstrated that, when uncorrelated independent variables are involved, the standardized beta weights associated with each of the second-level outcomes provide measures of the valence each subject associated with each of these factors in arriving at Decision A. An average standardized beta weight of 0.67 (S.D. = 0.21) was associated with an improved grade-point ratio (GPR), an average standardized beta weight of 0.09 (S.D. = 0.15) was associated with the esteem of classmates, and an average standardized beta weight of 0.46 (S.D. = 0.22) was associated with personal satisfaction. These results, which have been summarized in Exhibit 2, indicate that the experimental manipulation of the second-level outcomes was successful.

The first of the three hypotheses presented earlier in this study proposed that the force model provides accurate predictions of a student's motivation to strive

EXHIBIT 3

RELATIONSHIP BETWEEN EXPECTANCY AND MOTIVATIONAL FORCE



When $E_{ij}=0.10$, the mean value for $F_i=6.2$.
When $E_{ij}=0.50$, the mean value for $F_i=7.7$.
When $E_{ij}=0.90$, the mean value for $F_i=8.8$.

for academic success. Using the hierarchical regression analysis technique described in detail by Arnold and Evans [1979] and Cohen [1978] and employed previously by Stahl and Harrell [1981] and Harrell and Stahl [1984], it was determined that 65 of the 77 student subjects employed additive processes in reaching their decisions, rather than the multiplicative processes implied by the force model. The use of a multiplicative model resulted in only a very small increase in predictive ability, even for those 12 subjects who actually did employ multiplicative processes. Accordingly, the results presented here are for the additive approach employed by most subjects. Using this approach, the predictive ability of the force model was examined by using multiple regression analysis, with each person's Decision B value (Exhibit 1) serving as the dependent variable and each person's Decision A and likelihood information values serving as the independent variables. A subject-by-subject approach was employed to use the within-person analysis approach, so 77 individual multiple regression models were required. As hypothesized, the force model's predictive ability was found to be quite good, with a multiple correlation coefficient of $R=0.85$ being typical of the average subject.

The second hypothesis proposed that increases in the value of the expectancy variable would result in declining marginal increases in the value of the motivational force variable. In the context of the decision-making exercise, this hypothesis implies that the difference between the value of each subject's Decision B (F_i in Equation 1) values when expectancy (E_{ij} in Equation 1) equaled 0.50 and when expectancy equaled 0.10 (D1), is expected to be greater than the difference between the value of each subject's Decision B values when expectancy equaled 0.90 and when expectancy equaled 0.50 (D2). The D1 values are, therefore, predicted by H2 to be larger than the D2 values. The paired samples *t*-test was used to examine these relationships in order to block on subjects and maintain the within-person approach appropriate for expectancy theory research. The D1 values ($\bar{x}=1.4$) were found to be larger than the D2 values ($\bar{x}=1.1$), providing empirical support for H2 ($t=1.88$, $p.=.03$). The hypothesized relationship between the value of expectancy and the value of motivational force is evident when the results are presented graphically, as in Exhibit 3.

The third hypothesis predicts that the level of an accounting student's motivation to achieve academic success is positively correlated with the individual's actual academic performance. This ancillary hypothesis was not derived from the force model, which focuses upon an individual's motivation rather than upon the person's actual performance. To examine the third hypothesis, each student's average value of Decision B was computed separately for the cases where expectancy equaled 0.10, 0.50 and 0.90. These three values were then correlated with each student's academic grade average for two semesters of intermediate accounting. Each student's average Decision B value when expectancy equaled 0.10 correlated positively with each subject's average grade for two semesters of intermediate accounting ($r=.24$, $p.=.03$). Each student's average Decision B value when expectancy equaled 0.50 correlated positively with each subject's average grade for two semesters of intermediate accounting ($r=.28$, $p.=.02$). No significant relationship was observed between these variables when the value of expectancy equaled 0.90. These results indicate that, in the first two instances, those students who possessed the higher level of motivation to achieve academic success did, in fact, receive higher grades than their contemporaries.

SUMMARY AND DISCUSSION

This study examined three research hypotheses. The first hypothesis (H1) proposed that the force model of expectancy theory provides accurate predictions of a student's motivation to strive for academic success. The empirical data provided strong support for this hypothesis, as a multiple correlation coefficient of $R=0.85$ was obtained for the average subject. The second hypothesis (H2) proposed that increases in the value of expectancy result in declining marginal increases in the value of motivational force. The data also provided empirical support for this hypothesis. Previous empirical support for this hypothesis has been presented by Rynes and Lawler [1983]. The third hypothesis (H3) proposed that a student's motivation to strive for academic success is positively related to the student's actual academic performance. A person's performance is believed to be determined primarily by two factors, the person's ability and the person's motivation to achieve success [Vroom, 1964]. Only one of the two variables believed to determine an individual's performance was considered in this study. Since only one of the two key variables was examined here, correlations involving a particular event, such as grades received in a particular academic course, would not normally be expected to be strong. Significant positive correlations were found to exist between these two variables when expectancy equaled 0.10 and 0.50; no significant relationship was found to exist between these variables when expectancy equaled 0.90. With the difficulties described above in mind, the mixed results were judged to provide empirical support for the third hypothesis (H3).

Some limitations of the study should be kept in mind when interpreting the results. The sample of subjects ($n=77$) was relatively small. The participants were selected on the basis of their availability and were all students at a single southeastern university, so generalizations to wider populations of students should be made with caution. The experimental nature of this research suggests, however, the generalizability of the results is wider than these limitations imply. Swieringa and Weick [1982] argue that the generalizability of research which examines the explanatory or predictive ability of a theory is determined by the generalizability of the theory. Expectancy theory is, of course, believed to be appropriate in a wide variety of settings and situations. A strength of this research is the use of decision modeling to provide a within-persons approach for the examination of the force model of expectancy theory. The empirical results provided by the relatively small but growing body of research employing this approach [Stahl and Harrell, 1981, 1983; Rynes and Lawler, 1983; Harrell and Stahl, 1984] indicates its practical, as well as methodological, superiority over the conventionally used across-persons approach for expectancy theory research. The results of this study demonstrated that: (1) the ability of the force model to explain an accounting student's motivation to achieve academic success is very good; (2) increases in expectancy of success result in declining marginal increases in a student's motivation to succeed; and (3) motivation to achieve academic success, as measured by the person's effort level decisions, is positively related to the person's actual behavior (academic success, as indicated by course grades).

IMPLICATIONS FOR ACCOUNTING EDUCATORS

The implications of the research findings for the grading policies of accounting educators are straightforward. The examination of the first hypothesis indicates a student's motivation to achieve academic success can be accurately predicted from two primary variables, the attractiveness of achieving academic success and the expectancy that effort will lead to academic success. The attractiveness of academic success differs among students and relates to the individual's personal value system, an area in which many accounting educators believe they exert relatively little influence. It seems likely, however, that the valence of the second-level outcomes (an improved grade-point ratio, esteem of classmates and feeling of personal satisfaction) associated with the attractiveness of academic success might be stressed by accounting educators. The relationship between improved grades and job opportunities seems clear, but could be emphasized in class. Public recognition by the accounting faculty of those students who achieve excellent grades might increase these students' esteem among their classmates. Emphasizing in class that achieving excellent grades is a significant personal accomplishment might increase a student's sense of personal satisfaction.

The accounting educator clearly has the ability to influence the second variable in the force model equation, expectancy of success, by adopting either a very conservative, a relatively moderate, or a very liberal policy of awarding grades. The very low expectancy of success which results from a very conservative grading policy can be expected to result in a relatively low level of student motivation. The higher expectancy of success which results from a relatively moderate grading policy can be expected to lead to a correspondingly higher level of student motivation. As indicated by the examination of the second hypothesis, however, providing a student with a very high expectancy of success through the use of a very liberal grading policy results in disproportionately smaller (marginally declining) increases in student motivation.

The study results also have implications for the manner in which a student's course grade is earned proportionately during a semester or quarter. If examinations and other graded activities are scheduled in such a way that a student's course grade is largely determined by performance during the first half of the term, there is a low expectancy that effort expended by the student during the latter half of the term will have an impact upon the final course grade. In such circumstances the student should be expected to exhibit a low level of motivation during the latter part of the term. Several approaches which have been used by the authors in their own classes are likely to avoid this situation. One might, for example, place great importance upon the final examination in determining a student's overall course grade. This approach provides the student with a high expectancy that a substantial study effort during the last few weeks of the term can result in achieving success, while at the same time it provides a high expectancy that a relatively low study effort during this period can result in failure. Although such an approach does appear to motivate students, it has not proved to be popular with the students taught by the authors. Our students have expressed their concern about the relatively high expectancy of failure they associate with this grading approach. A more popular approach that appears to provide the same motivational objective involves giving a comprehensive final examination which takes on additional importance in determining the final course grade when students are allowed the option of discarding the results of one earlier examination.

This research represents an initial application of the decision modeling approach to provide a within-person examination of the ability of Vroom's [1964] force model to explain an accounting student's motivation to strive for academic success. The results support the proposal that the force model can provide accounting educators with a useful conceptual framework for understanding a student's motivation. It is hoped that this initial effort will stimulate other accounting educators to employ the decision modeling approach to examine the impact of various aspects of the classroom environment upon the motivation of accounting students to achieve academic success.

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THE ACCOUNTING REVIEW
Vol. LX, No. 4
October 1985

The Economic Function of Doctoral Programs in Accounting: Alternative Theories and Educational Implications

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ABSTRACT: Differences in faculty beliefs as to the economic function of accounting doctoral programs may contribute to the heterogeneity of educational policies and practices that exist across programs. Many accounting doctoral program policy makers appear to adhere, explicitly or implicitly, to either the "human capital" or "screening" theories of occupational licensing/certification. This study compares these two theories and evaluates the educational policies and practices they imply. The analysis suggests that, when relied upon to provide perspective in resolving policy questions, rather than in an orthodox fashion, these theories can provide useful guidance to accounting doctoral program policy makers.

ALTHOUGH all doctoral programs in accounting seek to produce graduates capable of contributing to the academic profession, the educational process differs significantly from program to program. On the surface, this lack of uniformity across programs might appear to be attributable to a wide variety of factors, including differences in the training and expertise possessed by faculties and differences in incentives for faculty to share their expertise with doctoral students. Faculty expertise and incentives do differ, but there is reason to believe that differences in underlying faculty beliefs (held explicitly or implicitly) as to the economic function of accounting doctoral programs may contribute significantly to the heterogeneity of educational policies and practices.

During recent conferences focusing on doctoral programs in accounting (see e.g., American Accounting Association [1984]), opinions expressed by participating policy makers concerning such matters as curriculum, financial support for candidates, and admission, retention, and completion standards tended to reflect basic differences in underlying beliefs as to the economic function of such programs. While some participants favored policies consistent with the view that such programs should serve to induce potential accounting academics to invest in and develop their expertise or skills (i.e., "human capital"), others favored policies more consistent with the view that such programs should serve to differentiate (i.e., "screen out") academically competent from incompetent individuals.

Although not all differences in accounting doctoral program policies and

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Manuscript received January 1984.
Revisions received July 1984 and March 1985.
Accepted May 1985.

practices can be neatly categorized as being more consistent with one view or the other, many policies and practices can be analyzed and evaluated from this perspective.

I. ECONOMIC VIEWS OF ACCOUNTING DOCTORAL PROGRAMS

The "human capital" view of occupational licensing/certification arrangements such as doctoral programs in accounting differs significantly from the "screening" view.[1] The "human capital" view or theory suggests that the function of such arrangements is to induce potential sellers of professional services, such as accounting academics, to invest in and increase their competency by obtaining further education and training (see e.g., Becker [1962, 1964]). Under this view, the training and testing that must be completed by a successful candidate for the license or certificate is viewed as an investment that will yield returns in the form of additional economic opportunities. Since the return to be earned by successful candidates is assumed to be directly related to the level of investment required to earn the license or certificate, such as a Ph.D. in accounting, there is an incentive to invest one's time, effort, and resources in completing the program.

By contrast, the "screening" view suggests that the function of such arrangements is to "screen out" incompetent practitioners by either legally excluding them from the market (as in the case of occupational licensing) or providing a means by which competent practitioners can voluntarily differentiate themselves from incompetent practitioners by having a credible third party certify their competency to potential buyers (see, e.g., Arrow [1973], Spence [1973, 1974], Stiglitz [1975], Reeve [1983], and Johnson [1984]). Under this view, the training and testing that must be completed by a successful candidate provides a "signal" to the market which enables competent individuals to identify themselves to potential consumers. Since the cost of earning the license or certificate is assumed to be lowest for competent candidates, occupational licensing/certification arrangements, such as accounting doctoral programs, provide competent candidates with a low-cost opportunity to benefit themselves and to reduce consumer uncertainty with respect to quality.

While each view has received widespread support in the literature, adherence to one view may contribute to the adoption of accounting doctoral program policies and practices that are considerably different from those adopted under the other. This potential divergence of educational policies and practices can be analyzed by comparing how the problem would be formulated by a policy maker rigidly adhering to the "human capital" view *vis-a-vis* the "screening" view.[2] (See Appendix A for a formal presentation of each view.) For instance, since the greatest returns on investment in training tend to be earned by specialists (see, e.g., Rosen [1983]), a

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[1] Technically, it is possible to distinguish mandatory licensing (such as the arrangements administered by state C.P.A. boards) from voluntary licensing or certification (such as the C.M.A. arrangement administered by the Institute of Management Accountants). In the former, the license must be obtained before an individual is legally permitted to offer or sell a particular service in the market. In the latter, the certificate, though not legally required, provides additional market opportunities because of its general acceptance as an indicator of achievement and competence. Since the Ph.D. or D.B.A. has elements of each, programs awarding these degrees are referred to as licensing/certification arrangements.

[2] The assumption of "rigid adherence" to one view versus the other is adopted because the analysis of these polar cases can provide greater theoretical insight into the inherent differences in the educational policies and practices suggested by each. For expository purposes, the accounting doctoral program policy maker's perceived problem under each view is characterized by a modified version of the basic agency model. This formulation, which characterizes the policy maker as the principal and the doctoral candidate as an agent, offers both analytical and conceptual advantages in differentiating the policies and practices suggested by each respective view.

"human capital" view would lean to a more "specialized" curriculum with greater restrictions on thesis topics and research methods. Conversely, since competent candidates tend to differentiate themselves more efficiently in an environment that affords greater freedom in preparing to meet standardized retention and completion requirements (see, e.g., Akerlof [1976]), the "screening" view suggests the imposition of a more "generalized" curriculum and fewer restrictions on thesis topics and research methods. As a result, the training and research experiences of candidates completing "human capital" programs tend to be more specialized than those of candidates completing "screening" programs.

Another difference in the educational policies and practices suggested by these alternative formulations involves retention and completion standards. For example, since the return to be earned by a successful candidate is assumed to be related to the amount invested, the "human capital" view suggests that retention and completion standards ought to be more "individualized" to induce the maximum feasible investment by each candidate. By contrast, since the emphasis is on allowing competent candidates to differentiate themselves and complete the program at lower cost, the "screening" view suggests the imposition of "standardized" retention and completion requirements. Consequently, the length of time required to complete a "human capital" program would tend to be more uniform across candidates than it would in a "screening" program.

Although identifying each view may provide guidance in resolving certain questions, there may also be problems created by adhering too tightly to either position. For instance, strict adherence to a "human capital" view may pose a danger that highly competent candidates will be required to over-invest. On the other hand, the "screening" view may pose a danger that high-quality candidates will emerge with inadequate training.

II. EVALUATING ACCOUNTING DOCTORAL PROGRAM POLICIES AND PRACTICES

Studies of professional training methods and requirements (see, e.g., Grossman, Kihlstrom, and Mirman [1977]; Itami [1983a]) suggest that, in developing academic skills, accounting doctoral candidates should be encouraged to take advantage of their previous training and experiences, in addition to any comparative advantage the program may possess in the form of faculty expertise and nonfaculty resources such as computing facilities and data bases. Since candidate backgrounds and comparative advantages of programs differ, any meaningful criteria for evaluating accounting doctoral program policies and practices must recognize both these differences and the fact that the technical training candidates need to perform satisfactorily is changing over time.

One set of criteria for evaluating accounting doctoral program performance that recognizes program-to-program differences in comparative advantages and candidate pools and the changing nature of the academic environment is suggested by the "learning by doing" theory that has recently evolved in the economics and industrial administration literature (see, e.g., Arrow [1962]; Spence [1981]; Itami [1983b]). These criteria favor programs whose successful candidates develop a reasonable level of new or improved academic skills and expertise (i.e., result in "optimal accumulation," rather than "under- or over-accumulation"). (Additional discussion of this notion of "optimal accumulation" is provided in the Appendix.) Specifically, this set of criteria includes:

TABLE 1

CRITERION-BY-CRITERION ASSESSMENT OF POLICIES AND PRACTICES OF "HUMAN CAPITAL" AND "SCREENING" PROGRAMS

Criterion	*"Human Capital" Programs*	*"Screening" Programs*
"Optimal Accumulation"	Generally perform well in terms of this criterion, although optimality depends on both extent to which the more "specialized" training received is compatible with the needs of the changing academic environment and the extent to which the more "individualized" retention and completion standards are compatible with the best interests of individual candidates.	Generally do not perform well in terms of this criterion—highly competent candidates may be induced to "under-accumulate" new or improved skills or expertise—although performance in terms of this criterion ultimately depends on the program's "screening efficiency."
"Optimal Faculty/Nonfaculty Resource Support"	Performance depends on how compatible a particular program's more specialized resource set is with the needs of the changing academic environment.	Performance depends on how well a particular program's more generalized resource set is able to accommodate individual candidates' needs to develop the specific skills and expertise needed to take advantage of economies of specialization available in the academic environment.
"Optimal Intra/Interdisciplinary Balance"	Generally perform well in terms of this criterion, although optimality depends on the ability to induce candidates to seek out intradisciplinary training available in order to complement their specialized training.	Generally perform well in terms of this criterion, although optimality depends on the ability to induce candidates to seek out more specialized training available in related disciplines in order to complement their intradisciplinary training.

Criterion 1

("Optimal Accumulation"): A program's policies and practices should induce accounting doctoral candidates to "accumulate" new or improved skills and expertise to prepare them to take advantage of economies of specialization that exist and adapt to a changing academic environment, without "under- or over-accumulating."

Criterion 2

("Optimal Faculty/Nonfaculty Resource Support"): A program's policies and practices should promote the development and maintenance of a faculty and nonfaculty resource set capable of supporting a candidate's efforts to accumulate new or improved skills and expertise, without unnecessarily duplicating resources available in related disciplines or under-investing in resources essential to intradisciplinary training.

Criterion 3

("Optimal Intra/Interdisciplinary Balance"): A program's policies and practices should promote the use of resources both within the accounting area itself and in other related disciplines, without neglecting intradisciplinary training or isolating candidates from the resources available in related disciplines.

A criterion-by-criterion assessment of the educational policies and practices of "human capital" and "screening" accounting doctoral programs is summarized in Table 1. As the analysis indicates, rigid adherence to either view may produce policies and practices that are optimal in terms of certain criteria and suboptimal in terms of others.

Although performance ultimately depends on the individual properties of particular programs, the analysis suggests that "human capital" programs may tend to outperform "screening" programs in terms of the first criterion, but neither type is clearly superior in terms of the second or third criteria. This result suggests that, while neither view may lead to strictly optimal educational policies and practices by itself, each may be capable of providing valuable guidance to accounting doctoral program policy makers.

CONCLUSION

This study has analyzed and compared differences in the educational policies and practices suggested by the "human capital" and "screening" views as to the economic function of accounting doctoral programs. Although programs that rigidly adhere to one view or the other may be less common in practice than programs that fall somewhere between these extremes, the analysis provided insights as to the nature and implications of each view. For example, the analysis suggests that "human capital" programs tend to impose more specialized curricula and thesis requirements and more individualized retention and completion standards than "screening" programs. The analysis also suggests that, when these resultant policies and practices are assessed on the basis of "learning by doing" criteria, "human capital" programs may outperform "screening" programs in terms of some criteria but not others.

The analysis also sheds light on many of the phenomena currently associated with accounting doctoral programs. For example, the greater flexibility with which candidates are allowed to select thesis topics and research methods and complete the research may help explain why the number of "ABDs" (i.e., candidates who have completed all requirements for the degree except thesis) who prematurely accept academic positions and never complete their degree (or complete only after an inordinate delay) appears to be far greater for "screening" programs. Similarly, the emphasis on doctorally qualified faculty imposed by AACSB accreditation requirements may help explain the greater popularity of "screening" programs and the reluctance of many highly competent candidates to invest the time, effort, and resources to develop their full academic potential.

While methodological limitations inhibit the ability to assess the relative optimality of "human capital" or "screening" programs in terms of all three of the criteria considered, the analysis raises questions as to the wisdom of rigid adherence to either view when formulating accounting doctoral program policies. When relied upon to provide guidance in resolving policy questions, rather than in an orthodox fashion, however, such views can provide useful guidance to policy makers.

APPENDIX A

Under the "human capital" view, a policy maker would seek to induce candidates to maximize their investment in the development of marketable academic expertise, subject to the realization that successful candidates must be able to earn an acceptable return on their investment in order to be attracted to the program. In formal terms, this problem can be stated as

$$\max_{\substack{\eta \epsilon \Xi \\ r(\cdot) \epsilon R \\ i \leq I}} \int\int G(I - r(y))\phi(\mathrm{I}, y \mid i, \eta)\, dI dy$$

$$\text{Subject to: } \int U(r(y),i)\phi(y\,|\,i,\eta)dy \geq K$$
$$i \in Argmax\,[\int U(r(y),i')\phi(y\,|\,i',\eta)dy]$$
$$i' \leq I$$

where $(I-r(y)) \equiv$ a particular candidate's maximum feasible investment (in the form of time, effort, and assets) in the program (I) less an assessment of the amount uninvested $(r(y))$,

$y \equiv$ the assessment of the candidate's level of investment in the program,

$i \equiv$ the candidate's actual level of investment in the program,

$\eta \equiv$ the monitoring system used to assess a candidate's level of investment in the program,

$K \equiv$ the minimum return on the amount that a program can require a candidate to invest and still be able to attract candidates to the program, and

$Argmax\,f(\cdot) \equiv$ the set of variables that, for a function $f(\cdot)$, maximize $f(\cdot)$.

By contrast, under the "screening" view, a policy maker seeks to differentiate competent from incempetent candidates in the most expedient and reliable fashion, subject to the realization that the program must exhibit some minimum level of credibility in the market for its graduates in order to be able to attract candidates to the program. In formal terms, this problem can be stated as

$$\max_{\substack{\eta\in\Xi \\ m(\cdot)\in M \\ c\in C}} \int\int F(S-m(y))\phi(S,y\,|\,c,\eta)\,dSdy$$

$$\text{Subject to: } \int U(m(y),p)\phi(y\,|\,c,\eta)dy \geq E$$
$$p \in Argmin\,[\int U(m(y),p')\phi(y\,|\,p',\eta)\,dy]$$
$$p' \leq P$$

where $(S-m(y)) \equiv$ the program's "screening efficiency" (the total number of candidates screened by the program (S) less the number of candidates incorrectly screened $(m(y))$,

$y \equiv$ the assessment of a particular candidate's level of academic competence,

$c \equiv$ a candidate's actual academic competence,

$\eta \equiv$ the monitoring system used to assess a candidate's level of academic competence,

$E \equiv$ a minimum level of "screening efficiency" required in order for the program to be considered acceptable by potential candidates,

$Argmin\,f(\cdot) \equiv$ the set of variables that, for a function $f(\cdot)$, minimize $f(\cdot)$, and

$P \equiv$ a candidate's maximum attainable level of performance.

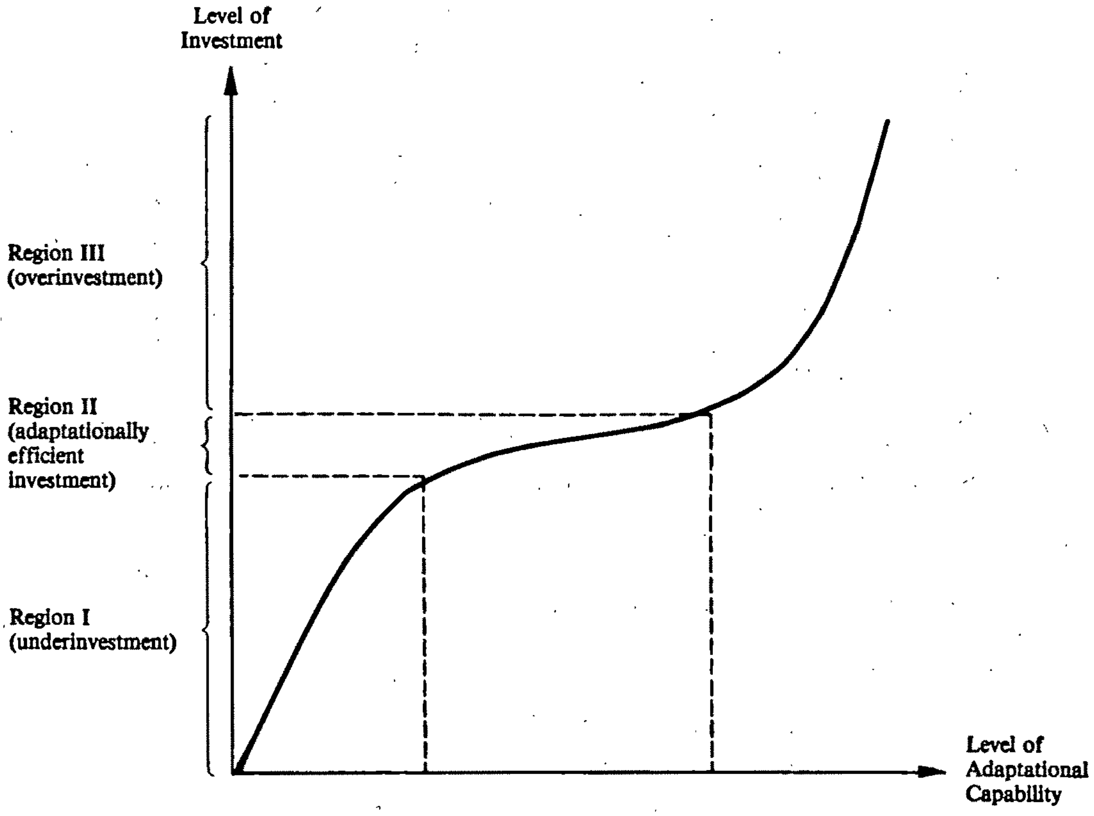
APPENDIX B

"OPTIMAL ACCUMULATION" IN A CHANGING ACADEMIC ENVIRONMENT

Given the availability of increasing returns from specialization and the changing demands of the academic environment, the optimal strategy for training accounting doctoral candidates involves inducing them to invest enough time, effort, and resources to develop special-

FIGURE 1

SUGGESTED RELATIONSHIP BETWEEN LEVEL OF INVESTMENT AND ADAPTATIONAL CAPABILITY



ized skills without investing to the point where their ability to adapt to change is impaired. This level of investment is referred to as "optimal accumulation" and corresponds to Region II in Figure 1.[3] A candidate's skill set will evolve from A^c (the current state) to A^f (the future set) as a result of his/her program completion strategy (S^n). S^n is determined by the program's policies and practices, such as retention and completion standards (P^n) and the candidate's preexisting skill set (A^f). P^n is determined by the program's educational philosophy and faculty/nonfaculty resource set and evaluated in terms of the demands of the changing academic environment (E^n). Possible results are: "*Under-accumulation*": Candidate i's program completion strategy (S_i^n) does not adequately develop the new or improved skills and expertise needed

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[3] This function is assumed for expository purposes only. The true shape of this function is presently unknown, but there is some evidence to indicate that the relationship between the level of investment and the level of adaptational capacity attained may approximate that shown. While any investment falling within Region II is referred to as "adaptationally efficient," the optimal investment level is located at the convex inflexion point (i.e., the point farthest to the right in Region II).

$$E^n > \phi_i(A_i^f | S^n | P^n, A_i^a) \qquad \text{for all } i.$$

"*Over-accumulation*": Candidate *i*'s program completion strategy (S_i^n) requires a heavier investment of time, effort, and resources than is needed

$$E^n < \phi_i(A_i^f | S^n | P^n, A_i^a) \qquad \text{for all } i.$$

"*Optimal Accumulation*": Candidate *i*'s program completion strategy (S_i^n) develops the new or improved skills or expertise needed without over-investing

$$E^n = \phi_i(A_i^f | S^n | P^n, A_i^a) \qquad \text{for all } i.$$

As Itami [1983b] has demonstrated:
In a *static* (academic) environment

Overaccumulation > Optimal Accumulation > Underaccumulation.

But, in a *changing* (academic) environment

Optimal Accumulation > Underaccumulation > Overaccumulation.

Therefore, accounting doctoral programs should seek to develop educational policies and practices that lead to the adoption of program completion strategies that result in the optimal accumulation of new and improved skills and expertise by candidates.

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THE ACCOUNTING REVIEW
Vol. LX, No. 4
October 1985

FINANCIAL REPORTING

Clyde P. Stickney, Editor

The Measurement of the Current Portion of Long-Term Lease Obligations—Some Evidence from Practice

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ABSTRACT: There are currently no definitive guidelines for reporting the current and noncurrent portions of lease obligations. Two possible approaches to this problem of allocation—the change in present value approach and the present value of the next year's payments approach—have been identified by Swieringa [1984]. This article addresses two aspects of this financial reporting issue. First, evidence is presented to show that the change in present value approach appears to be dominant in current financial reporting practice. Second, it is shown that adjustment of the reported financial statement numbers to those that would be obtained by the present value of the next year's payments approach does not affect the ranking of companies by a number of financial measures. These results suggest that the issuing of guidelines for reporting the current and noncurrent portions of lease obligations by the FASB is not warranted.

SWIERINGA [1984] recently examined the financial reporting requirements for lease obligations. He noted that the FASB provides no guidelines for measuring the current and noncurrent portions of lease obligations and that two approaches—the present value of the next year's payments (PVNYP) approach and the change in present value (CPV) approach—might be employed for this allocation. Swieringa showed that Med General, Inc. used the former approach in its 1978 annual report but the latter approach in its 1979 annual report and pointed out the differential impact of the two approaches on financial statement analysis. He concluded by stating his support for the PVNYP approach and calling upon the FASB to consider this problem and issue some guidelines.

The author gratefully acknowledges helpful comments from the editor, two anonymous reviewers, and his colleagues, Paul Dunmore, Haim Falk and James Gaa.

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Manuscript received June 1984.
Revisions received November 1984 and April 1985.
Accepted May 1985.

TABLE 1

COMPANIES USED IN THE STUDY

1. Ames Department Stores Inc. 1981
2. Amfac Inc. 1980
3. APL Corp. 1981
4. Armco Inc. 1981
5. Baxter Travenol Laboratories Inc. 1981
6. Belding-Heminway Co. 1981
7. Carter-Wallace Inc. 1981
8. Cheseborough Ponds Inc. 1980
9. Church's Fried Chicken Inc. 1980
10. Clark Oil and Refining Co. 1980
11. Cleveland Cliffs Iron Co. 1980
12. Combustion Engineering Inc. 1980
13. Conoco Inc. 1980
14. Cooper Industries Inc. 1981
15. Crown Zellerbach Corp. 1981
16. Del E. Webb Corp. 1980
17. Eastern Airlines Inc. 1979
18. Facet Enterprises Inc. 1981
19. Fleming Cos. Ltd. 1981
20. Gamble Skogmo Inc. 1980
21. General Foods Corp. 1980
22. The Great Atlantic and Pacific Tea Co. Ltd. 1981
23. Gulton Inds. Inc. 1980
24. G. D. Searle and Co. 1980
25. Hart, Schaffner and Marx 1980
26. Kroger Co. 1979
27. Leslie Fay Inc. 1979
28. Lockheed Corp. 1981
29. Natomas Co. 1980
30. North American Coal Corp. 1979
31. Orange and Rockland Utilities 1980
32. Owens Illinois Inc. 1980
33. Peoples Drug Stores Ltd. 1980
34. Pitney Bowes Inc. 1981
35. Purolator Inc. 1980
36. Robertshaw Controls Co. 1980
37. Roper Corp. 1980
38. Southland Corp. 1981
39. Todd Shipyard Corp. 1981
40. Vulcan Materials Co. 1980
41. Wal-Mart Stores Inc. 1981
42. Weyerhauser Co. 1979

The purpose of this paper is to investigate two questions that arise from Swieringa's article. First, what is the evidence for the use of the two approaches in financial reports, i.e. is there any uniformity of practice? Second, what is the impact on financial statement analysis of using one approach rather than the other?

SAMPLE

To ensure that companies whose financial performance is of wide public interest were examined, a sample of 170 companies was randomly selected from a list of 1,461 companies on the New York Stock Exchange for which common stock risk measures had been compiled by the Rodney L. White Center for Financial Research of the University of Pennsylvania. The annual reports of the 170 companies for the years 1979, 1980, and 1981 were examined for information on capital leases. Ninety-six (56 percent) of these companies gave no information on capital leases or stated that capital leases were not material. Of the 74 companies that provided some information on capital leases, 15 (nine percent) presented only the present value of the lease obligations, 17 (ten percent) presented a schedule of lease payments and the present value of the lease obligations, and 42 (25 percent) presented a schedule of lease payments, the present value of the lease obligations, and the amount allocated to the current portion of the lease obligations. Only these last 42 companies provided sufficient information to carry out the analysis aimed at answering the questions raised above.[1]

The names of the 42 companies are shown in Table 1. The capital lease information for one year for each company

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[1] The 32 companies which could not be included in the study because they provided only partial information on capital leases did not disclose the current portion of the lease obligations. Presumably, this was not disclosed because it was not considered material. If this explanation is correct, it adds support to the conclusion later in this paper that the impact of changing the approach to measuring the current portion of lease obligations is not sufficiently material to warrant further consideration by the FASB.

TABLE 2

AMORTIZATION TABLE FOR ILLUSTRATIVE LEASE EXAMPLE

Year	PV	Accrued Interest	P_i	PV_e
1	3,790.79	379.08	1,000	3,169.87
2	3,169.87	316.99	1,000	2,486.85
3	2,486.85	248.69	1,000	1,735.54
4	1,735.54	173.55	1,000	909.09
5	909.09	90.91	1,000	0

was used in the analysis. This was the latest of the three years examined for which complete and reliable information was available. Because these companies were chosen randomly and include a variety of industry types, they appear to provide a reasonably representative sample.

USE OF THE PVNYP AND CPV APPROACHES IN PRACTICE

The following information relating to lease obligations reported in the financial statements was used: the lease payments (normally reported as annual amounts in years one to five and a combined total for years thereafter), the present value of the lease obligations, and the amount of the current liability relating to leases.

Analysis of Interest Rates

Two related analyses were used to provide evidence about the relative use of the PVNYP and CPV approaches in practice. One analysis compares the average interest rates implicit in the leases estimated by three methods. The first estimate of the interest rate was the internal rate of return (IRR) calculated from the reported present value and lease payments. The second estimate of the interest rate (INT_C) was made assuming the CPV approach was used in preparing the financial information reported for lease obligations. The third estimate of the interest rate (INT_P) was made assuming the PVNYP approach was used in preparing the financial information reported for lease obligations.

To illustrate the method of analysis, consider a lease consisting of five annual payments (P_i, $i=1-5$) of $1,000 each and a present value (PV) of $3,790.79. For the initial analysis, the payments are assumed to occur at yearly intervals starting one year from the date of the financial statements.[2] The internal rate of return for the lease is 10.00 percent.

An amortization table calculated using an interest rate of 10.00 percent for this lease is given in Table 2. If the CPV approach is used, the noncurrent portion of the lease liability ($LNCL_C$) at the beginning of the year is set equal to the present value of the lease at year-end and the current portion of the lease liability (LCL_C) is set equal to the change in present value between the beginning and end of the year. Thus, at the beginning of year 1, $LNCL_C=\$3,169.87$ and $LCL_C=\$3,790.79-3,169.87=\$620.92$.[3]

In general,

$$\begin{aligned} LCL_C &= PV - PV_e \\ &= PV - (PV + r^* PV - P_1) \qquad (1) \\ &= P_1 - r^* PV \end{aligned}$$

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[2] This assumption is consistent with the analysis presented by Swieringa [1984].

[3] Note that the value for LCL_C is equal to the present value of the last year's lease payment as shown by Swieringa [1984], i.e. $LCL_C = 1,000(1.10)^{-5} = \$620.92$.

where PV_e is the present value of the lease obligation at the end of the year, and r is the interest rate for the lease.

Conversely, the interest rate for the *CPV* approach can be calculated from the reported data (P_1, *LCL* and *PV*), as

$$INT_C=(P_1-LCL)/PV \tag{2}$$

For the example, $INT_C=(1{,}000-620.92)/3{,}790.79=10.00\%$, as expected.

If the PVNYP approach is used, the current portion of the lease liability (LCL_P) is set equal to the present value of the next year's lease payment, i.e.,

$$LCL_P=P_1/(1+r) \tag{3}$$

and the noncurrent portion of the lease liability ($LNCL_P$) is set equal to the present value of the lease at the beginning of the year less the amount assigned as the current portion of the lease liability. Thus, at the beginning of year 1, $LCL_P=1{,}000./1.10=\$909.09$ and $LNCL_P=\$3{,}790.79-909.09=\$2{,}881.70$.

Conversely, the interest rate for the *PVNYP* approach can be calculated from the reported data as

$$INT_P=P_1/LCL-1 \tag{4}$$

For the example, $INT_P=1{,}000./909.09-1=10.00\%$ if the value of LCL_P (calculated by the *PVNYP* approach) is used. If LCL_C and LCL_P are substituted in the equations for the interest rates for the *PVNYP* and *CPV* approaches, respectively, this yields $INT_C=(1{,}000.-909.09)/3{,}790.79=2.40\%$ and $INT_P=1{,}000./620.92-1=61.05\%$. That is, the calculated interest rates are dramatically different and quite unrealistic.

The discussion above provides a method to determine whether the *CPV* or *PVNYP* method was used to prepare the numbers reported in the financial statements. Substitution of the values of P_1, *LCL*, and *PV* reported in the annual report of a company in equations 2 and 4 may be expected to lead to a reasonable interest rate for the methods used to prepare the financial data, but an unreasonably low or high value for the other method.

For the analysis of the sample data, it was assumed initially that the first lease payment is due one year from the date of the financial statements with subsequent payments due at one-year intervals. Because the payments beyond year five are reported as a combined total, it was assumed that the combined total was to be paid in annual amounts equal to the payment in year five with any lesser amount due in a final year.

Values were calculated for *IRR*, INT_C, and INT_P using the data *PV*, P_i, and *LCL* reported in the financial statements. The results of these calculations are presented in columns 2–4 of Table 3 and imply the relative use of the *CPV* and *PVNYP* approaches in practice. The fact that the values of INT_P are much greater than any realistic practical interest rate suggests that it is highly unlikely that the *PVNYP* approach was used in the preparation of the lease information for any of the companies in this sample. Examination of the calculated interest rates and the summary statistics in Table 3 plus the Spearman rank correlation coefficients[4] below shows that there is close and significant agreement between *IRR* and INT_C but not between *IRR* and INT_P.[5]

Spearman Rank Correlation Coefficients

	IRR	INT_C
INT_C	0.663	
INT_P	0.310	0.408

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[4] The literature [Deakin, 1976; Foster, 1978, Chap. 6; Frecka and Hopwood, 1983] indicates that financial measures are not normally distributed so that parametric tests are inappropriate; therefore the non-parametric Spearman rank correlation coefficient was used.

[5] A calculated Spearman rank correlation coefficient greater than 0.400 indicates a significant relationship at the 0.01 level (one-tailed test).

TABLE 3

COMPARISON OF ESTIMATED INTEREST RATES AND CURRENT LIABILITIES FOR LEASE OBLIGATIONS (ASSUMING LEASE PAYMENTS AT END OF YEAR)

*Company**	*IRR(%)*	*INT_c(%)*	*INT_r(%)*	*LCL($)*	*LCL_c($)*	*LCL_r($)*
1	10.28	9.54	255.86	759	608	2,499
2	9.12	8.66	396.59	1,934	1,525	8,802
3	6.74	7.08	86.75	249	260	436
4	5.86	9.17	268.42	3,800	7,482	13,225
5	7.89	6.07	59.48	1,846	1,517	2,729
6	7.08	7.49	24.75	198	201	231
7	10.50	9.68	47.73	132	127	176
8	9.33	7.77	144.81	848	603	1,899
9	11.26	10.72	379.57	186	150	802
10	10.87	10.63	138.53	3,143	3,045	6,762
11	8.61	8.70	119.94	682	691	1,381
12	8.63	8.01	105.65	1,842	1,691	3,487
13	7.71	7.00	110.32	16,132	14,337	31,500
14	8.90	7.25	34.08	10,828	9,985	13,331
15	7.04	10.74	48.15	5,400	6,296	7,474
16	9.66	10.60	57.91	708	744	1,020
17	7.87	6.74	79.73	54,637	47,316	91,032
18	8.48	8.46	50.66	1,058	1,057	1,469
19	8.56	6.78	112.97	2,513	1,770	4,930
20	11.46	10.26	147.84	4,883	4,037	10,857
21	10.64	9.76	73.51	2,363	2,206	3,706
22	13.52	11.70	196.13	12,851	8,935	33,525
23	11.69	7.80	29.36	361	308	418
24	5.72	7.85	116.75	806	1,060	1,652
25	22.75	16.71	215.83	120	26	309
26	10.27	9.25	330.23	3,057	1,942	11,927
27	7.50	7.67	178.38	37	39	96
28	16.16	12.96	59.26	10,800	9,219	14,808
29	8.38	7.24	38.81	7,541	7,077	9,658
30	6.07	4.96	66.92	1,457	1,240	2,293
31	7.58	6.39	59.58	757	673	1,123
32	8.20	6.51	138.46	2,600	1,666	5,730
33	7.14	7.27	22.10	1,095	1,100	1,248
34	12.28	11.61	501.55	1,098	779	5,883
35	7.06	7.68	110.31	320	348	629
36	9.48	7.66	38.97	621	564	788
37	8.63	7.96	75.42	2,514	2,354	4,060
38	11.12	9.67	135.52	16,408	13,080	34,778
39	7.36	8.74	73.58	776	866	1,255
40	9.08	9.77	114.59	809	875	1,592
41	11.22	10.69	451.74	3,270	2,541	16,222
42	7.77	7.77	129.46	10,065	10,073	21,430
Mean	9.41	8.78	139	4,560	4,057	8,979
Standard deviation	3.00	2.13	119	9,029	7,817	15,793
Standard error of mean	0.46	0.33	18	1,393	1,206	2,437

* Company— See Table 1 for identification

All these observations support the conclusion that the *CPV* approach was used by the companies in the sample.

To determine the sensitivity of the results to the assumption of the timing of the payments, the previous analysis was repeated assuming that the first lease payment was due six months from the date of

TABLE 4

COMPARISON OF ESTIMATED INTEREST RATES AND CURRENT LIABILITIES FOR LEASE OBLIGATIONS (ASSUMING LEASE PAYMENTS AT MIDDLE OF YEAR)

*Company**	*IRR(%)*	*INT_c(%)*	*INT_p(%)*	*LCL($)*	*LCL_c($)*	*LCL_p($)*
1	11.20	10.20	1,166.39	759	568	2,561
2	9.68	9.14	2,365.99	1,934	1,476	9,170
3	7.49	7.66	248.75	249	254	449
4	6.48	9.77	1,257.34	3,800	7,242	13,567
5	8.79	6.60	154.34	1,846	1,481	2,823
6	9.59	9.19	55.62	198	196	236
7	13.27	11.33	118.23	132	121	183
8	10.16	8.31	499.33	848	573	1,978
9	12.19	11.47	2,199.87	186	142	842
10	12.37	11.67	468.97	3,143	2,881	7,072
11	9.72	9.44	383.74	682	658	1,432
12	9.61	8.68	323.90	1,842	1,632	3,618
13	8.50	7.49	342.32	16,132	13,736	32,572
14	9.83	8.42	79.77	10,828	10,208	13,853
15	8.28	12.80	119.48	5,400	6,322	7,688
16	11.72	12.33	149.35	708	728	1,058
17	8.77	7.29	223.04	54,637	45,724	94,157
18	10.19	9.65	126.99	1,058	1,028	1,519
19	9.31	7.24	353.57	2,513	1,700	5,119
20	12.65	11.20	514.24	4,883	3,943	11,402
21	12.32	10.99	201.05	2,363	2,153	3,869
22	15.67	12.79	776.95	12,851	7,164	35,384
23	14.25	9.37	67.35	361	306	437
24	6.11	8.45	369.80	806	1,067	1,696
25	26.11	18.92	897.51	120	21	337
26	11.06	9.83	1,750.94	3,057	1,793	12,480
27	8.19	8.15	674:95	37	37	99
28	19.17	15.57	153.64	10,800	9,307	15,756
29	9.56	8.29	92.70	7,541	7,089	10,001
30	6.57	5.29	178.62	1,457	1,220	2,356
31	8.37	6.97	154.65	757	667	1,160
32	8.74	6.89	468.64	2,600	1,633	5,946
33	8.39	9.05	49.09	1,095	1,113	1,284
34	13.35	12.45	3,518.60	1,098	700	6,204
35	7.54	8.27	342.31	320	351	649
36	11.32	8.85	93.13	621	553	818
37	9.73	8.75	207.71	2,514	2,301	4,210
38	12.27	10.53	454.69	16,408	12,717	36,471
39	8.69	9.72	201.31	776	837	1,292
40	9.93	10.73	360.47	809	878	1,656
41	12.17	11.42	2,944.21	3,270	2,289	17,035
42	8.62	8.34	426.51	10,065	9,622	22,160
Mean	10.66	9.75	608	4,560	3,915	9,348
Standard deviation	3.53	2.49	804	9,029	7,553	16,388
Standard error of mean	0.55	0.38	124	1,393	1,166	2,529

* Company—See Table 1 for identification

the financial statements with subsequent payments due at one-year intervals.

If *PV* in our example remains at \$3,790.79 but $P_1 = \$1,000$ is received in six months and subsequent P_i at one year intervals, $IRR = 12.31\%$, $LCL_C = \$593.12$ and $LCL_P = \$943.61$. Substitution of the values for LCL_C and LCL_P into

TABLE 5

COMPARISON OF REPORTED AND CALCULATED INTEREST RATE DATA FOR CAPITAL LEASES

Company	*(No.)*	*Reported*	*Unweighted Average of Range*	*Calculated-Table 3(4)*		
				IRR	INT_c	INT_p
Armco	(4)	4.8	4.8	5.86(6.48)	9.17(9.77)	268.42(1257.34)
Church's	(9)	3.89–15.25	9.57	11.26(12.19)	10.72(11.47)	379.57(2199.87)
Owens Illinois	(32)	3.5–8	5.75	8.20(8.74)	6.51(6.89)	138.46(468.64)
Roper	(37)	7	7	8.62(9.73)	7.96(8.75)	75.42(207.71)
Wal-Mart	(41)	8.5–14.0	11.25	11.22(12.17)	10.69(11.42)	451.74(2944.21)

the equations used to determine them yields $INT_C = INT_P = 12.31\%$, as expected. But, substitution into the alternative equations yields $INT_C = 1.712\%$ and $INT_P = 184.26\%$. That is, use of the incorrect equations yields dramatically different and unrealistic interest rates when lease payments are assumed to occur at the middle of the year, as well as when lease payments are assumed to occur at the end of the year as shown earlier.[6]

The results of the revised calculations for the sample data are presented in columns 2–4 of Table 4. As expected, all estimated interest rates have increased, with the increases in *IRR* and INT_C being relatively small (an absolute increase of 0.3–3.3 percent) whereas the increases in INT_P are extremely large. Examination of the calculated interest rates and the summary statistics in Table 4, plus the Spearman rank correlation coefficients below, support the conclusion that the *CPV*, not the *PVNYP*, approach was used for all companies in this sample.

Spearman Rank Correlation Coefficients

	IRR	INT_C
INT_C	0.710	
INT_P	0.158	0.241

Five of the companies reported an interest rate range or an average interest rate relating to the capital leases in the fiscal year being examined. These are summarized in Table 5 together with some data from Tables 3 and 4. The fact that the values of *IRR* and INT_C are consistent with the reported data and agree fairly well with the unweighted average of the range, while INT_P is much greater than the reported data, provides further support for the conclusion that the *CPV* approach was used by the 42 companies in the sample. In addition, it provides support for the soundness of the estimated internal rates of return which are used in the analysis in the next section of the paper.

Analysis of Current Portion of Lease Obligations

The second analysis done to provide evidence about the use of the *PVNYP* and *CPV* approaches in practice compares the

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[6] The assumption of monthly lease payments was also investigated. Values for *IRR*, INT_C and INT_P were calculated for a number of variations of the illustrative example in Table 2 with lease payments assumed to be made monthly at the end of each month. The results were compared with those obtained assuming annual lease payments at the end of each year and at the middle of each year. It was found that the calculated interest rates for payments at the end of the month and at the middle of the year were somewhat greater than for payments at the end of the year, as expected. However, the calculated interest rates for payments at the end of the month and at the middle of the year did not differ significantly. Therefore, the analysis of the sample data was not repeated for the assumption of monthly lease payments. (The formulae for monthly payments and the results of these computations are available from the author.)

TABLE 6

SPEARMAN RANK CORRELATION COEFFICIENTS FOR SELECTED FINANCIAL MEASURES

Measure	*Correlation Coefficient* *Assuming Lease Payments at:* *End of Year*	 *Middle of Year*
Current portion of lease obligation	0.967	0.967
Current portion of lease obligation (normalized)	0.904	0.905
Current liabilities	1.000	1.000
Current liabilities (normalized)	0.998	0.997
Working capital	0.995	0.994
Working capital (normalized)	0.999	0.999
Quick ratio	0.999	0.999
Current ratio	0.997	0.995

reported current portion of the lease obligation (LCL) with estimates obtained from the *PVNYP* and *CPV* approaches. The results of this analysis are presented in columns 5-7 of Tables 3 and 4. *LCL* agrees more closely with LCL_C than LCL_P and supports the conclusion that the *CPV* approach was used by the companies in the sample.

The analyses presented above all support the conclusion that the *CPV* approach was used by all 42 companies in the sample. Given that these companies came from a randomly chosen sample, it is reasonable to conclude that the *CPV* approach is dominant in reporting lease obligations.

Impact on Financial Statement Analysis

In this section, the question of whether the *PVNYP* and *CPV* approaches would lead to significantly different rankings of companies for several commonly-used financial measures is investigated.

In deciding which financial measures to use, two criteria were employed: first, the financial measures must be affected by the two alternative approaches; second, they must be commonly known and probably used in financial analysis. The financial measures chosen are: current portion of the lease obligation, total current liabilities, working capital, quick or acid test ratio, and current ratio, In addition, the first three were also examined in normalized form, where total assets was used to convert them from a dollar value to a fraction.

On the basis of the analysis done earlier, it was assumed that the data reported in the financial statements were calculated using the *CPV* approach. Each of the selected financial measures was recalculated for the *PVNYP* approach.[7] Then, the rankings of the companies by each financial measure for the two approaches were compared using the Spearman rank correlation coefficient. The results of these calculations are shown in Table 6 for the two assumptions as to the timing of the lease payments.

The Spearman rank correlation coefficients for the selected financial measures all exceed 0.90 and are significant at a level of less than 0.01. Thus, the ranking of companies by these financial measures is likely to be the same for both approaches to determining the current portion of long-term lease obligations.[8]

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[7] For example, the reported value of *LCL* was compared to the value of LCL_P calculated from equation 3. The reported value for current liabilities (CL) was compared to the value of the total current liabilities (CL_P) which would be obtained for the *PVNYP* approach. The latter was calculated by subtracting the reported *LCL* from the reported *CL* and adding the calculated LCL_P (i.e., $CL_P = CL - LCL + LCL_P$). The value of CL_P was used to calculate values for working capital, quick ratios, and current ratios appropriate for the *PVNYP* approach to compare to the values of these ratios calculated using the reported data.

CONCLUSIONS

The analyses presented here show that all the companies in the sample are using the *CPV* rather than the *PVNYP* approach for reporting capital lease obligations and that adjustment of the accounting data to the *PVNYP* approach does not significantly change the rankings of these companies for a number of financial measures. The results obtained for this randomly selected sample suggest that a uniform approach to determining the current portion of capital lease obligations exists in practice and that changing this approach would not have a significant effect on the rankings of companies in financial analysis. Consequently, it is not clear that the FASB should expend the resources to study this problem and issue guidelines as suggested by Swieringa [1984].

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Swieringa, R. J., "When Current is Noncurrent and Vice Versa!," THE ACCOUNTING REVIEW (January 1984), pp. 123–130.

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[8] A natural question is why the rankings of the companies for the various financial analysis measures are so little affected when the interest rates vary so significantly for the *CPV* and *PVNYP* approaches. One reason for this is that the current portion of lease liabilities is generally a small fraction of the total current liabilities as shown by the following summary statistics.

	Reported		*Ratio*
	CL ($000)	*LCL ($000)*	*LCL/CL(%)*
Mean	401,957.	4,560.	1.48
Standard deviation	549,215.	9,029.	1.80
Standard error of mean	84,746.	1,393.	0.28

In addition, there is a significant rank correlation between the reported current portion of lease liabilities and the values calculated by the *CPV* and *PVNYP* approaches as shown by the Spearman rank correlation coefficients below.

	Year-End Payments		*Mid-Year Payments*	
	LCL	LCL_c	LCL	LCL_c
LCL_c	0.984		0.983	
LCL_p	0.967	0.942	0.967	0.935

THE ACCOUNTING REVIEW
Vol. LX, No. 4
October 1985

BOOK REVIEWS

Harvey S. Hendrickson, Editor

EDITOR'S NOTE: Books for review should be sent to Professor Harvey S. Hendrickson, School of Accounting, College of Business Administration, Florida International University, Miami, FL 33199.

(The policy of the *Review* is to publish only those reviews solicited by the Book Review Editor. Unsolicited reviews will not be accepted.)

WILLIAM H. BEAVER and WAYNE R. LANDSMAN, *Incremental Information Content of Statement 33 Disclosures* (Stamford: Financial Accounting Standards Board, 1983, pp. ix, 108, $25.00 paper).

This Research Report served as input to the FASB in its review of Statement 33 and should provide guidance in future research on the information content of changing price disclosures. Beaver and Landsman build on an earlier research design by Beaver, Griffin, and Landsman by using a cross-sectional, two-stage regression model to investigate whether the Statement 33 supplementary disclosures provide information content over and above that provided by the primary historical cost financial statements. The authors state: "The major finding can be stated simply and briefly. Statement 33 earnings variables provide no incremental information over and above that already provided by historical cost earnings. This finding holds whether information content is defined for the purpose of explaining stock price changes or for the purpose of explaining differences in the market value of common equity across firms" (p. 15). These findings are based on a sample of 731 nonfinancial, calendar year-end firms reporting Statement 33 data for 1979, 1980, and 1981 and included in the Statement 33 data bank.

The theoretical analysis in Chapter 2 shows that although Statement 33 data have the potential to provide information about the effects of *unanticipated* price changes that historical cost accounting cannot, Statement 33, as applied in practice, may contain measurement errors which reduce its usefulness. In particular double-counting of inflation may occur when general or specific price adjustments are made to historical cost financial statement elements which may already include an adjustment for *anticipated* inflation. Thus, how well Statement 33 data perform is a function of two conflicting factors—the potential information content and the potential measurement errors.

Which of the two factors is dominant is an empirical issue and is addressed in Chapters 3 and 4 along with a presentation of the empirical findings. Historical cost earnings are compared with six Statement 33 earnings variables: Income from continuing operations (IFCO) under current cost, IFCO under current cost plus general purchasing power gains, IFCO under current cost plus gross (nominal) holding gains, IFCO under current cost plus general purchasing power gains plus holding gains net of inflation, IFCO under historical cost/constant dollar, and IFCO under historical cost/constant dollar plus general purchasing power gains.

The evidence indicates that historical cost earnings dominate the Statement 33 earnings variables in that none of the Statement 33 variables shows consistently significant additional explanatory power for changes in stock prices. But the reverse is not true. The authors "turn the tables" by investigating whether historical cost earnings have additional explanatory power once the Statement 33 variables are known. Historical cost earnings indeed possess additional explanatory power. To ensure the validity of the initial research design, several alterations are made. Even with the alterations, historical cost earnings continue to be the victor. The authors extend the initial research by investigating the ability of the various earnings measures to explain differences in the market value of common equity across firms. The Statement 33 data did not possess superior explanatory power in this regard.

As a side note, Chapters 3 and 4 have typographical errors. On page 53, "1980" should be inserted between the words "of" and "dollars" on line four, and on page 90 in the fifth line from the bottom of the page, the word "of" should be "or."

The concluding chapter offers some explanations for the inability of Statement 33 data to provide incremental information content. The authors state that three interpretations are consistent with the findings of the study: (1) an adjustment is not being made or is too small to be detected empirically because unanticipated inflation was not material from 1979 through 1981; (2) if an adjustment for inflation is being made, Statement 33 data are unrelated to the adjustments, e.g., because the data contain measurement errors; and (3) an adjustment is not being made because of lack of understanding, lack of familiarity, or lethargy on the part of the users (p. 100).

The authors offer two suggestions for reducing the possible measurement errors in Statement 33 data: (1) encourage firms to use used asset prices in determining current cost, and (2) encourage firms, especially nonutilities, to invoke the recoverable value concept when this amount is less than current cost. According to the authors, these suggested procedures could increase the ability of Statement 33 data to provide incremental information content.

In summary, the Research Report is an excellent demonstration of how to use accounting research to harmonize financial reporting standards and financial reporting objectives. Thus, it would be a useful reference monograph in a graduate accounting theory course. In addition to its usefulness to the FASB, the Report also has utility to anyone interested in financial reporting and changing prices. Typical of the Beaver style, it is flawlessly researched, carefully organized, and well written.

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PAUL R. BERNEY and STANLEY J. GARSTKA, *Accounting: Concepts and Applications* (Homewood: Richard D. Irwin, Inc., 1984, pp. xxii, 680, $28.95).

Berney and Garstka provide a case and user-oriented approach to introductory accounting. In the relatively short space of 680 pages, they present material often found in both the financial and managerial accounting courses (or a combination one-semester financial-managerial course). They explain the different topics concisely with a minimum of detailed technical discussions.

The authors divide the text into 25 chapters. The first four explain the accounting model including one on what is called the "Mechanics of accounting." The next 11 cover financial accounting topics. Here, Berney and Garstka display a distinct user orientation, an example of which is their grouping of current asset and current liability topics into two chapters on working capital. The topic presentation is very current as demonstrated, for example, by their inclusion of ACRS depreciation. The final ten chapters cover management accounting topics, also with a user-oriented approach. Discussions of the mechanics of cost accounting topics, such as absorption and variable costing, are minimized, and the material on standard costing and cost allocation is presented before the cost-volume-profit model. Thus the organization gives the instructor an opportunity to explain how the firm's accounting for manufacturing costs affects the financial accounting results prior to explaining how managers use accounting data for making internal decisions. The coverage also is sufficient to provide adequate background for understanding the management-decision-oriented chapters such as capital budgeting, short-term decision making, and performance evaluation.

The authors typically approach a topic by giving a short discussion of important concepts, and then an example situation that incorporates and illustrates the concepts. Finally, six or seven cases and problems are included at the end of the chapter to provide a forum for examining the chapter's practical and conceptual issues.

Students learning accounting within this framework need to have a reasonably high tolerance for ambiguity. The cases and problems build on chapter material by providing insightful situations not always completely explained in the text. For example, the presentation of the statement of changes in financial position concentrates on deriving working capital from operations by the direct format that starts with working capital revenues and subtracts working capital expenses. The reconciliation format that starts with net income and adds back non-working capital expenses and subtracts non-working capital revenues is only briefly discussed. But most of the cases and problems use the reconciliation format. A further complicating characteristic of several chapters is a lack of any "easy" procedural- or drill-type questions; instead students are asked to expand upon chapter material beginning with the first case or problem.

The teacher's manual is the sole supplement; the authors have not provided the workbook, test bank, or set of overheads that typically are available with an introductory text. Someone using the book for the first time should take the time to carefully review the solutions in the teacher's manual to discover the cases for which the authors provide fairly comprehensive teaching notes, since no summary or highlighting is given to identify them. This review is well worthwhile since the authors supply interesting insights for expanding the case discussion into a general understanding of important concepts not covered in depth in the text.

In summary, the book delivers the promised insights into the concepts and applications of both financial and managerial accounting. It is oriented toward the MBA or upper-division undergraduate student and assumes a greater knowledge of business terminology than most introductory texts. For those who prefer a case-oriented approach to introductory accounting, this book should be on the list of texts to be considered.

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Leonard Eugene Berry and Gordon B. Harwood, *Governmental and Nonprofit Accounting: A Book of Readings* (Homewood: Richard D. Irwin, Inc., 1984, pp. xvii, 401, $15.95 paper).

The editors of this book of readings have gathered 30 articles in eight general topic areas. Each topic is presented in a single chapter consisting of three to five papers. Each chapter begins with a one- or two-page overview by the editors and also includes a list of suggested additional references. The editors' purpose in selecting these articles was twofold. First, some articles expand upon topics traditionally included in governmental accounting texts (i.e., financial reporting and budgeting). Second, a number of articles introduce new topics that could be considered areas of emerging interest (i.e., municipal fiscal stress, the single-audit concept). The articles represent a mix of practical and conceptual issues and cover such diverse topics as municipal, federal, and nonprofit accounting and reporting; planning, budgeting, and managerial accounting; and auditing in the public sector. An overview of academic research in governmental accounting also is included as the last chapter.

The editors state that this book could be used as a supplement in an upper-level course in governmental accounting or public administration. To facilitate this, the editors cross-reference the readings with relevant chapters in three leading governmental textbooks. The book also could be used to supplement the two or three governmental chapters included in most advanced accounting texts that usually do not progress beyond the basic debit and credit issues of governmental accounting. The readings in this book would provide a good pedagogical device for introducing more conceptual and timely (and often more interesting) issues into the presentation of governmental accounting. The overview of academic research also would be useful in a graduate-level course or seminar.

The five papers on municipal financial accounting are particularly good and interrelate quite well. These papers deal extensively with conceptual issues such as the needs of users of governmental financial statements, the nature of the governmental reporting entity (National Council on Governmental Accounting [NCGA] Statement No. 3), and the current status of governmental GAAP. This last issue includes discussion of reporting compliance issues and the reasons for and against establishing the recently created Governmental Accounting Standards Board (GASB). All five articles raise many issues that can lead to interesting and energetic classroom discussions.

Many of the papers in other topic areas also are quite stimulating and informative, although they tend to be a little less cohesive. The papers on municipal fiscal stress represent a unique and welcome inclusion which is very timely. The papers which discuss planning and budgeting are somewhat more practical although they still provide many opportunities for discussion of a wide range of issues. The presentations on zero-base budgeting and strategic planning are especially interesting, but others may be too applied to stimulate much student interest.

The chapter dealing with nonprofit organizations is relatively short and the weakest in the book. One of the papers duplicates material that usually would be included in a textbook. The other two papers are focused narrowly and of limited interest when compared to other articles in the volume.

In conclusion, with few minor exceptions, the editors have succeeded in collecting a set of thought-provoking articles that can be used as supplemental readings in a variety of courses dealing with governmental accounting. The topics included are timely, interesting, and occasionally unique. The articles should stimulate student thought and discussion, and their organization gives the instructor flexibility to use them in a variety of ways.

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EDWARD BLOCHER and JOHN J. WILLINGHAM, *Analytical Review: A Guide to Evaluating Financial Statements* (New York: McGraw-Hill Book Co., 1985, pp. x, 195, $24.95).

The objectives of this book are to explain what analytical review (AR) is, when AR techniques can be used, and how they can be used. The book is reasonably successful in achieving the first two objectives but less so in achieving the third. The authors' primary target audience is practicing auditors. In general, the material seems correctly targeted to that audience.

The book can be summarized into three overall categories: (1) an overview of the AR process (Chapter 1); (2) an explanation of four types of AR—risk analysis, trend analysis, ratio analysis, and reasonableness tests (Chapters 2–5); and (3) an explanation of when and how to use AR (Chapters 6–8).

This book makes four main contributions. First, the different types of AR are described thoroughly. As the authors note, because AR is not well-defined, both consensus and consistency are lacking in its application. This can lead to both inefficient and ineffective auditing, problems that this book could help to alleviate. Second, the book alerts practitioners to some significant issues and research at a level they can understand. For example, it describes bankruptcy prediction models, notes the dangers of auditor judgment biases, and explains the benefits of the causal approach to trend analysis. Third, it provides explicit examples of AR applications. Fourth, it gives illustrations of AR documentation worksheets that should be useful for purposes of working paper development.

Four weaknesses in the book should be noted. First, the pace and organization require a patient and persistent reader—particularly in the early stages where the material is extremely basic and slow-moving. Indeed, the most useful material appears to be in two of the last three chapters. Second, the level of the materials is inconsistent. At one extreme, an undergraduate accounting student would not be challenged. Examples of this include the overview in Chapter 1, the definitions and descriptions of basic ratios, and the explanation that different accounting conventions can affect ratio measures. At the other extreme, many practicing auditors would be overwhelmed. Examples of this include suggestions that the log transform be used to generate a more nearly symmetrical distribution of ratios, and that log transforms and antilogs be used in dealing with nonlinear relationships in regression models.

The third weakness is a potentially confusing discussion in Chapters 1 and 2 of risk analysis and inherent risk analysis. Perhaps because of the duplicate terminology, the distinction between these two risk concepts is unclear. Further, inherent risk itself is described at the beginning of Chapter 2 as having *three* aspects: operating, financial, and market risk. But in the chapter summary *four* elements of inherent risk are identified: operating and financial risk, management integrity, and organizational control environments. Including market risk, this yields *five* elements (aspects?) of inherent risk. The book does not clarify what should be analyzed.

The final weakness concerns how AR can be used. Too often AR is used simply because such procedures exist. Practicing auditors need guidance on more than the mechanics of AR. They need to be shown how to integrate these procedures into the overall audit process. The book should provide more examples, including specific illustrations of the tradeoffs between AR and other audit procedures.

This book would be a useful addition to the library of most practicing auditors, so long as they bear in mind the broad audience for whom it is written. Not all sections necessarily will warrant the same level of attention. This book does not appear to have a major academic role, other than as a library reference. But this is not surprising in light of the authors' objectives.

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J. EFRIM BORITZ, *Planning for the Internal Audit Function* (Altamonte Springs: The Institute of Internal Auditors Research Foundation, 1983, pp. xvi, 342, $37.50).

This book is based upon a research study commissioned by the Institute of Internal Auditors. It consists of six well-written chapters that were developed from the author's previous experiences, his review of planning and coordinating activities in several internal audit departments, and his review of the extant literature. Chapters 1 and 2 present an overview of the study and a discussion of planning concepts, respectively, while nine case studies comprise Chapter 3. The remaining three chapters (4–6) describe procedural aspects (i.e., the "how-to's") of the planning and coordinating activities in the management of internal auditing functions, including analyses of information structures and flows and information processing activities.

A primary thesis is that although judgmental (intuitive) and formal methods of planning and analysis often have been regarded as competitors, they actually are complementary. Accordingly, both judgmental and formal methods should be used in all comprehensive internal audit planning systems. The specific research questions were taken from prior research and included: (1) How much planning is enough? (2) What are the cost-benefit relationships in planning? (3) How should uncertainty be handled? (4) What kinds of planning approaches and practices are appropriate? (5) How is planning related to control? (6) What is the role of computers in planning? (7) How can one tell whether a proposed plan is good? (8) How can one represent problems to solve with the aid of plans in such a way as to compensate for human problem-solving limitations? (9) How does one cope with imperfect or unavailable information upon which to base plans? (10) For whom is the planner planning? (11) How does one measure progress toward a planned goal, how does one maintain a proper perspective, and how does one focus attention on key issues? and (12) How does one deal with ambiguity and conflicting goals? (p. 7)

These research questions deal with a broad and somewhat diverse set of issues that reveal the ambitious scope of the book. But while such a strategy ensures that the book will contain something for almost every potential reader, it also effectively constrains the extent to which topics can be covered. Thus, for example, only rather cursory coverage is provided both on the specific planning tools and techniques in Chapter 6, and throughout the book on the findings and practical implications of extant behavioral accounting research. The former reads more like a survey than seems appropriate for a book emphasizing the "how to" while, despite its relative development and potential import, the latter appears only to be mentioned in passing.

Nevertheless, the book is reasonably successful at making the three contributions specified in Chapter 1 (p. 12): (1) it facilitates an understanding of planning theory and practice, (2) it disaggregates the myriad of tasks that comprise the planning process into manageable components, and (3) it provides a structured means of identifying information and processing requirements which can facilitate computerization of the planning process. But the value of these contributions will differ for each sector of the intended audience—internal auditors (specifically, managers of the internal audit function), external auditors, management, academicians, and students. For example, management and internal auditors, generally, are likely to find the book to be most beneficial, while the primary value of the book for academicians and students likely would be as a library reference source.

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DAVID H. BUTLER, *An Income Tax Planning Model for Small Businesses* (Ann Arbor: UMI Research Press, 1981, pp. viii, 324, $44.95 cloth, $19.95 paper).

This book is a revision of the author's doctoral thesis that was completed at the University of Cincinnati in 1978. The work describes an original computerized model that is designed for use by small businesses in deciding which form of business (i.e., a sole proprietorship, a partnership, a closely held corporation, or a subchapter S corporation) would be the most appropriate from a tax planning perspective. The model indicates the business form that minimizes the total income tax liability payable by and attributable to a small business owner which would arise over a five-year period of operation. Further, the book discusses a test in which the reliability of the model is examined.

The book is organized in a format that is typical for an accounting dissertation: the problem is stated; appropriate background information (e.g., relevant literature) is discussed; the research method is described; appropriate tests are performed; and then a summary of the conclusions and contributions of the study are given. Also included are several appendices that contain important and voluminous details relating to the study.

The research discussed in the book represents a commendable effort by the author. The difficulty of selecting the most appropriate form of business by a taxpayer is a very real problem which Professor Butler attempts to ameliorate. To perform the task the author develops a model that is a simplified representation of a complex environment facing small business taxpayers. The model appears to exclude various complex tax factors and opportunities for alternative planning scenarios that could be important. But as described in the research, it reflects a representation of many critical tax factors up to and including the provisions of the Revenue Act of 1978. Consequently, because of the model's inherently simplified nature and because it reflects tax law that has since been amended by several very substantial federal tax acts, its usefulness as a reliable tool to a contemporary small-business taxpayer is limited.

The usefulness of the contents of the book may be much greater to academics and others for pedagogical purposes. Although the research model may be both rudimentary and out-of-date, it represents a good beginning for this type of planning. This book could be an interesting supplemental text, perhaps in a doctoral tax research seminar, as an example of innovative tax research that has been conducted in the past. Further, with the planning model being presented in great detail along with voluminous supporting information, the work could provide the basis for extensions of the research.

In summary, Professor Butler's book presents a tax planning model that contains practical weaknesses that would currently inhibit its useful application in actual situations. However, the contents include enough detail for it to be used as a starting point for interesting pedagogical exercises and/or continued research in the area of tax modelling.

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KENNETH J. EUSKE, *Management Control: Planning, Control, Measurement and Evaluation* (Reading, MA: Addison-Wesley Publishing Co., 1984, pp. xvi, 136, $8.95).

The broad purpose of this book is to "help the reader develop an understanding of management control systems" (p. ix). The book contains seven chapters consisting of approximately 120 pages of narrative, figures, and tables. The author's approach throughout the book is to draw heavily on the works of other writers in the field and to try to integrate those writings into a meaningful whole. This is a monumental task, not fully achieved, as evidenced by the author's frequent listing of unanswered questions as he winds up the discussion on a particular topic.

Chapter 1 brings the topic into focus with a discussion of the definition and function of management control systems (MCS). The author asserts that no definitive model of MCS exists due to the absence of a well-explicated theory on which all models are based. He does, however, present a general model of MCS and uses this model as a framework for discussion throughout the text.

Chapters 2 through 5 deal with the four functions that management control supports and on which it relies—planning, control, evaluation, and measurement. Chapter 6 illustrates that theory is important to the understanding, design, and implementation of MCS, and that lack of theory may result in systems that may be carefully designed and implemented, but that do not produce predictable or desired results. It also discusses—albeit all too briefly—the relationship between decision making and theory development for planning, control, and evaluation.

Chapter 7 deals with key considerations in the design of management control systems, but does not fully meet its stated purpose of "tying together the ideas found in the previous chapters" (p. x), even though the topics treated are indeed fundamental to MCS design.

Given the thrust of the Addison-Wesley Paperback Series in Accounting, of which this book is a part, the discussion of the accountant's role in MCS should have been expanded. The author states clearly (Chapters 3 and 7) that the design of neither the control system nor the management control system should be left to technicians (including accountants). Chapter 4 also includes a one-paragraph assessment of accountants as evaluators; beyond this, little attention is given to the accountant's role.

The book meets one of the aims of the publisher's paperback series in that it provides comprehensive coverage of its topic in economical form. It has more breadth than depth due to the effort to cover a tremendous amount of material in a very limited space. Tripling the number of pages would do greater justice to the topic, but this would have sacrificed the reader advantage associated with brevity and conciseness.

Readability of the book is enhanced by the generous inclusion of definitions, examples, and illustrations. The reader will also be assisted by the author's consistent practice of stating the purpose of each chapter and how it relates to preceding and succeeding topics. Follow-up study of any of the topics is facilitated by the almost-too-frequent insertion of references to other works, the inclusion of suggested readings at the end of each chapter, and the very extensive bibliography.

Overall, the author accomplishes his objective in a very commendable way. The book does an excellent job of synthesizing the significant literature on management control systems and related topics. It should prove useful to those who already have some familiarity with the MCS literature, to those who are conducting their initial research into MCS-related subject areas, and particularly to those who are getting their first exposure to the topic. The book could be used as a supplementary text in an advanced managerial accounting course or in some business management courses.

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STEPHEN GILMAN, *Accounting Concepts of Profit* (New York: Garland Publishing, Inc., 1982, pp. xxii, 635, $65.00).

It is a special pleasure to look again at one of the major contributions to early American accounting literature. Stephen Gilman's *Accounting Concepts of Profit* still serves as a prewar *Accountants' Handbook* for scholars in the field. Indeed, I have continued to recommend it to serious students who wish to appraise the literature of accounting, get acquainted with early sources, and obtain a feel for the discussions that were once favorite topics at professional meetings and in executive board rooms.

Younger accountants may question the relevance of lengthy discussions that were current over a half-century ago, but they will find many surprising similarities to present arguments and methods. Corporate excesses of the '20s were similar to those of the recent conglomerate era. Pooling, as such, was not discussed, but recommendations for replacing goodwill with a form of "excess consideration" were advocated. The equity method of taking up affiliated earnings was discussed along with the usual problems of income measurement and asset valuation.

Gilman would have none of the current nonsense of replacing income statements with fund statements, and took his stand with those who meet liquidity needs with careful balance-sheet classification and profit realization with built-in working-capital requirements. He gave considerable attention to general price-level adjustments—a topic of wide interest in the '20s and '30s—and some attention to blue-collar corrections by way of LIFO, normal-stock techniques, and fixed asset appraisals.

Current readers may be disappointed with his failure to discuss off-balance-sheet financing (except in connection with mutually unperformed contracts), but they may be surprised at the wide controversy over off-income-sheet reporting of losses. This practice was so common that some firms recorded back-door charges that were larger than their reported income. At that time many accountants (including this one) often argued for surplus adjustments as a device for gracefully admitting past mistakes and thus not letting ancestral sins influence current or future earnings reports. A built-in bias was the probable result. Managers clearly had an incentive to overstate reported earnings, and many investors paid attention only to reported earnings and earnings per share. Certain accountants (Saliers, some income-tax specialists, and, I believe, Newlove) offered a fantastic alternative that permitted losses on obsolete assets to be added to the cost of their replacements. After all, it was argued, future periods will receive the benefit from being relieved of inefficient facilities, or, worse, a going concern cannot suffer capital losses!

Traditional problems of capital maintenance, income determination, and measurement are still with us in pretty much the same old forms. Fisher and Canning had already set forth sophisticated arguments for discounting expectations, and Schmalenbach had more or less balanced the scales by pointing out the near impossibility of valuing individual assets in a going concern. Entrance values received consideration, but the automatic provision for obsolescence in current market values was not widely understood. Exit values were treated mainly in connection with distressed merchandise and realization and liquidation reports. The covariance between exit and entrance values apparently was not considered. Entity separation and arms-length trading came in for attention, and intercompany transfer pricing was given rudimentary treatment. Until the arrival of modern concepts and techniques, transfer pricing usually was discussed in terms of actual versus standard costs or in connection with selling prices and profit centers.

In substantive matters Gilman was clearly an orthodox accountant. He was against cost or market because it is inconsistent and illogical. He was generally on the side of historical costs with depreciation interpreted as cost allocation. He clearly saw the similarity of inventories and fixed assets as deferred charges to operations, and in one of his less inspired moments came up with a related "deferred charges to cash" to cover monetary items. He was anti-LIFO, lamented the "arbitrary" features of base-stock methods, favored strict working capital rules for income realization, and felt uneasy with percentage-of-completion and other attempts to implement more closely the concept of income as value added. He gave considerable attention to current market valuations (especially for inventories) and to current replacement costs through appraisals of fixed assets. His going-concern orientation certainly is not consistent with the currently fashionable concept of command over resources in liquidation.

The newly formed Securities and Exchange Commission, along with such failures as McKesson and Robbins, spurred a frantic search for principles that continues even today. Gilman's thorough discussion of this frantic search takes up no less than 90 pages, plus numerous subsequent references and comments. In many instances, lists of principles with impossible defining properties were advanced and endless hours were then spent trying to find entities that would satisfy the requirements. Some accountants grew tired of the search and concluded that principles of accounting simply do not exist. All sorts of substitute concepts were introduced and Gilman dutifully, if not enthusiastically, set forth the resulting distinctions between such entities as standards, precepts, policies, conventions, dogmas, rules, doctrines, concepts, and the like. These discussions make dull reading, but they help explain the heavy hand of tradition that later obstructed the efforts of some able investigators, e.g., those of Moonitz and Sprouse.

The beginnings of behavioral accounting crop up in the conflict between the traditional orientation toward bankers and small entrepreneurs and the growing needs of absentee owners and evaluators of managerial performance. For reference groups Gilman selected economists, statisticians, and lawyers and did not emphasize the continental stress on good business administration or the broader framework of psychology and sociology. His discussion of entity theories is superb, and he was inclined to favor these orientations over various proprietary frameworks. In keeping with the times he shifted from a banking-credit framework to the viewpoint of investors. His concept of profit is traditional. He discussed in some detail the composite nature of a profit figure that includes implicit interest and various economic rents, but he (like other accountants) failed to consider profit as a windfall that cannot be predicted. Gilman's historical perspective is especially praiseworthy in that he was concerned more with broad developments than with the evolution of bookkeeping techniques. He was concerned with the period convention and the shift from venture accounting to the treatment of units of inventory as separate ventures. He traced the responsibility, release-from-responsibility approach beyond manorial lords in feudal England to Roman master-slave relations. He covered the early personification of accounts, the British double-account system and a host of related concepts. Modern accountants might have wandered on to the Sombart hypothesis on double-entry and the rise of capitalism, or to the Weber thesis that religion and capitalism may be mutually causative factors, or to Luther's argument that worldly gains (accounting profits?) may be evidence of God's reward for doing good works.

How shall we characterize Gilman and his scholarship? Certainly Gilman was a first-class professional accountant with great ability to organize and explain the diverse problems of our profession. His correspondence-school background may be a partial explanation for his straightforward, unpretentious style of writing. His scholarly instincts were simply unique in the accounting field and were generally superior to those demonstrated by teachers in our prestigious universities. In his own way he struck a telling blow for common folks everywhere against the arrogance and limited horizons so often displayed by high-level practitioners and, sadly, by many professors.

Gilman clearly was not a philosopher, a statistician, or even a classically trained economist. From time to time he lapsed into strictly semantic arguments and tossed around such loaded terms as distortion, true, consistent, arbitrary, and sound, as if they were arguments in themselves. Last-in, first-out "distorts" profits. Cost or market and the rule of conservatism are "inconsistent." Allocations are largely "arbitrary." Positions are "sound" if he agrees. Certain procedures yield "true" measures of depreciation and income.

As a theorist, Gilman did not highlight antecedent-consequent relations and try to relate such positive associations to scientific observations or to inferred or stated objectives and value systems. He did not employ the modern jargon of systems thinking with its holistic overtones and synergistic assumptions or the framework of positivism with its accompanying bag of mathematical models and abstract metatheories. He did employ non-technical pragmatism effectively and clearly understood the need for a functional approach to a service activity such as accounting. Unfortunately he seldom employed either framework with vigor to strengthen his arguments or to increase the precision of his rhetoric. He apparently enjoyed setting forth all conceivable sides of an argument and often was satisfied to make his contribution by presenting a consensus. When decisions were rendered, he usually agreed with contemporary angels —notably Paton.

While one may, with Wittgenstein and lesser lights, question the need to emphasize precedents for each new idea, many (e.g., David Green, Jr.) have castigated the accounting profession for its failure to utilize all the support our culture can afford. The latter group may find a comparison of Gilman with some of his contemporaries interesting. His 620 formal footnotes with almost as many direct quotations give the flavor of most intellectual leaders of the time. (Greer comes through as irascible, Byrne as compromising, Paton as crisp and dogmatic, Hatfield as ambivalent—satiric in most instances but consensus-seeking in his joint effort on principles.) The following footnote comparison uses approximate numbers: Hatfield's *Accounting*, 345, plus bibliography; Paton's *Theory*, 180; Scott's *Cultural Significance*, 145; Canning's *Economics of Accountancy*, 135; May's *Financial Accounting*, 95, plus a ten-page note in the form of an addendum; Littleton's *Structure*, 65 with one that includes 22 useful citations to the limitations of accounting; Esquerré's *Applied Theory*, 65. Quite a man, Gilman! Quite a scholar!

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EDITOR'S NOTE: Professor Devine prepared this review from his copy of the original edition that was published by Ronald Press Company in 1939 and had a list price of $5.00. Although reprinted in 1956, this book has not been reviewed previously in The Accounting Review; but Professor Devine prepared a review that appeared in *The Southern Economic Journal* (July 1940, pp. 107-108).

S. J. Gray with L. B. McSweeney and J. C. Shaw, *Information Disclosure and the Multinational Corporation* (New York: John Wiley & Sons, 1984, pp. xi, 236, $29.95).

The multinational corporation (MNC) is a relatively new form of business entity, although it has its antecedents in antiquity. It brings considerable economic, political, and social problems to policymakers and regulators both because of its organizational structure and its operational activities. Thus it is not surprising to find that these, in turn, create immense problems for financial reporters, auditors, and financial statement users. The power and fluidity of MNC operations ensure that it is extremely difficult to provide a reasonably fair presentation of them in terms of either the individual entities comprising the MNC or the consolidated entity itself. Professor Gray's book is a welcome addition to the accountancy literature, for little has been written previously on MNC financial reporting.

The text is largely descriptive but is well written and easily read. Stripped of the extensive reproductions of MNC reports and UN, OECD, and EEC statements on MNC reporting, the text extends to a little more than 100 pages. This means that little space is available for discussing in depth the various issues worthy of such treatment. The topics covered include developments in MNC accountability and disclosure, user demands and needs, problems of producing MNC reports, and specific accounting and reporting problems for MNCs.

The major themes that emerge from these topics are, first, that the "power" of MNCs can transcend national regulation and compete at government level in terms of influence and size; second, the very real difficulties facing MNCs when reporting and attempting to satisfy individual national needs, as well as those at international level; third, the considerable importance of employees and governments in increasing information disclosures, clearly exceeding those of traditional groupings such as investors and lenders; and, fourth, the inappropriateness of regulations attempting to adapt national disclosure requirements to MNCs.

Essentially, Professor Gray's book reveals the need in financial reporting for accountants to consider a proper classification of different types and sizes of corporation to determine the nature of disclosure required for each. On the evidence of the book, for example, it is difficult to conceive of similar disclosure requirements for both small family corporations and MNCs. Professor Gray and his colleagues have produced a text which allows the reader to think about these issues in relation to MNCs. It does not, however, provide any immediate answers.

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Anthony G. Hopwood and Hein Schreuder, Editors, *European Contributions to Accounting Research: The Achievements of the Last Decade* (Amsterdam: VU Uitgeverij/Free University Press, 1984, pp. vii, 274, Hfl. 40.00 paper).

Accounting researchers in the United States are both fortunate and unfortunate. Writing in their own language and in their own nation's journals they can be certain of a world-wide circulation for their ideas. On the other hand, many such researchers have little incentive to look beyond U.S. accounting theories, institutions, and practices, and, with a number of distinguished exceptions, may, even when submitting papers to a non-U.S. English-language journal such as *Accounting and Business Research*, display a lamentable ignorance of accounting outside their own country. There has long been little excuse for American ignorance of accounting in other parts of the English-speaking world. Hopwood and Schreuder's book now provides a guide to European accounting research that will be of inestimable value to those (including the British, who are being increasingly drawn into continental Europe) keen to expand their accounting horizons.

After an introduction by the editors, the book is divided into two parts of unequal length. The first contains national surveys covering Finland, Scandinavia, France, Germany (with some reference also to Austria and Switzerland), the Netherlands, the U.K., Italy, and Spain. The second contains three essays on the relationship between research and practice. The introduction stresses both the diversity of European accounting research, which has developed within tightly defined national boundaries and been written in many different languages, and the current emergence of a European accounting research community which has paralleled the increasing harmonization of company accounting law and practice within the EEC.

The national surveys display interesting variations of tone and emphasis (the editors have sensibly not tried to impose an artificial uniformity upon them). For example, the authors (Boussard and Rey) of the French chapter are well aware of foreign criticism of French accounting and rather plaintively observe that French accounting research "suffers from a lack of public debate, an absence of public criticism of the application of the Plan Comptable [national accounting plan], a non-involvement of both the professors and the practitioners working on the rules already established and a deficiency of basic research as opposed to the research inquiries conducted by legal institutions" (p. 41). Their chapter is a thorough and authoritative guide to French accounting education. In contrast, the chapter by Galassi on accounting research in Italy concentrates on that country's tradition of "concern economics" and pays no attention to foreigners' not always complimentary views of Italian accounting practice. The chapter on Spain is both realistic and optimistic, admitting the country's comparative backwardness in accounting matters but stressing the rapid progress and solid achievement of recent years.

The survey of management accounting research from a German view by Dörner and Kloock conveys the German passion for precise definitions and classifications. Very differently written, and more accessible to an American audience, is Busse von Colbe's chapter on some socioeconomic determinants of financial accounting research in Germany. The chapter contains the illuminating observation that while research following the user approach based on *a priori* decision models seems to lead to internationally similar results, different results appear if one tries to weigh conflicts of interest among the different user groups because these weights are different in different countries (p. 107). Klaassen and Schreuder's chapter on the Netherlands makes a similar point (pp. 123–4) and also provides a convincing explanation of the Dutch reluctance to develop a set of accounting standards of their own: "A small country in which many corporations are already affected by so many, and often so diverse, foreign standards simply cannot afford the luxury of another set of rules" (p. 127). Hopwood and Bromwich, in their chapter on accounting research in the U.K., draw attention to the contrast between the U.S. interest in the behavioral aspects of accounting and the British interest in its organizational aspects.

The three chapters in the second part of the book all deserve a wide readership. Schreuder's chapter on "positively normative (accounting) theories" is hard going in places but should be read by all who draw oversimple distinctions between positive research and normative research. Dent, Ezzamel and Bourn use the term "myth" to refer to the "rational and coherent vision of management accounting advanced in textbooks and authoritative pronouncements" (p. 234) and illustrate their discussion with the aid of two case studies, one from the private sector, the other from the public sector (and likely to be of personal interest to all academics who have been faced with an unexpectedly large cut in funding and at the same time been required to maintain the level of service provided).

The book ends with a lively and thought-provoking chapter by Jules Muis of the Amsterdam office of Ernst & Whinney (which firm provided financial support for the book's publication). While in favor of academics and practitioners working together, he is at pains to stress their different roles. He provides several topics for research, including the suggestion that major financial reporting patterns are determined "by historical fluke, power politics and expediency [rather] than by academic arguments . . . "(p. 262).

In summary, this is an important book. Its most appropriate use in the U.S. is likely to be in postgraduate international accounting courses.

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ROBERT E. JENSEN, *Review of Forecasts: Scaling and Analysis of Expert Judgments Regarding Cross-Impacts of Assumptions on Business Forecasts and Accounting Measures*, Studies in Accounting Research No. 19 (Sarasota: American Accounting Association, 1983, pp. xvii, 235, $15.00 paper).

This monograph surveys and analyzes quantitative methods for evaluating the importance of assumptions in forecasts (or judgments). Most of the topics discussed (e.g., assumptional analysis, cross-impact analysis, and futurism) have been developed and used primarily in the fields of mathematical psychology, technological forecasting, and decision sciences.

The monograph has seven chapters. The first contains a review of some concepts and methodologies used in analyzing the relative importance of forecast assumptions. The second introduces the notion of futurism and describes problems, approaches, and techniques of futurism research. Chapter 3 provides a brief review of methods that deal with the problem of assumptions interaction and cross-impact. The fourth (and shortest—14 pages) chapter surveys applications of assumptional analysis in the management science and behavioral science literature. Chapter 5 introduces and discusses two approaches for analyzing the impact or damage of one assumption upon another—the Analytic Hierarchy Process (AHP) and the Multivariate Subjective Composition. Chapter 6 describes a market research study in which scaling methods proposed in Chapter 5 are applied to derive scenario probabilities underlying marketshare forecasts of industry experts. The last chapter discusses selected problems that remain in applying assumptional analysis methods and provides suggestions for future research.

Given the broadening scope of accounting and the corresponding expansion of areas that are of interest, it is not surprising to find an AAA-sponsored monograph on these seemingly non-accounting topics. But the monograph does not effectively convey to the layman accountant the essence and relevance of the methods and techniques discussed therein. In fact, most of this reviewer's criticism of the monograph has to do with its perceived role of communicating new notions and methodologies to an accounting readership largely new to the field of assumptions analysis.

The first paragraph states that the purpose of the study is "to review, propose, adapt, and compare methodologies for analyzing assumptions . . ." (p. 1). It is quite difficult for a monograph geared presumably towards a readership that is unfamiliar with the problems, theories, and methodologies of assumptional analysis to both provide a review of the field and, at the same time, introduce new methodological developments. Indeed, there is even some confusion about the above stated objectives since the second paragraph states that the major intent of the paper is apparently not to provide a review but "to develop a newer methodology for scaling an expert's perceived impacts of assumptions on alternative scenarios . . ." (p. 1).

Too little is done in the way of introducing and explaining the numerous new terms and concepts discussed in the monograph. The heavy use of a scientific jargon, foreign to most readers, makes the text difficult to follow. Phrases and sentences like: "Whereas AHP entails mathematical composition (aggregation) across multiple *independent* linkages, this study also will develop subjective *interactive* composition methods" (p. 1); "Cardinal inconsistency in reciprocal dominance response matrices arises whenever . . ." (p. 14); or "The individual dimensions in multidimensional scaling solutions functionally resemble individual eigenvectors on any one level of our hierarchy" (p. 17)—all of which appear in the *introductory* chapter—may not be regarded by a novice as very illuminating.

The application of assumptional analysis is demonstrated in an actual case of market-share forecasts involving an optical services retail chain. More should be said, however, about the ultimate uses of the analysis: What decisions might be helped by its output? Does the process of opnion elicitation and assumption scaling improve the quality (i.e., efficiency, accuracy) of forecasts beyond the generation of richer expectational data? The monograph does not dwell sufficiently on these important points.

The monograph briefly discusses in fairly general terms the role of forecasting in accounting (Chapter 4). But no specific applications to accounting are discussed and demonstrated. The only detailed illustration of the application analysis is from the field of marketing (Chapter 6). The suggestions for future research made in the last chapter relate primarily to further methodological developments rather than to new applications of existing ones to the area of accounting. Given the target readership, this is a deficiency that diminishes the relevance of the monograph to accountants.

The monograph uses quotations extensively. While the quotations are well selected, their extensive use (they constitute about one-fourth of the text) at times disrupts the flow of the discussion.

The text is not always clear as to what are the new research results and what are the results and conclusions of previous studies. This is particularly important since the monograph is supposed to both review the literature and develop new methodologies. The contribution of the author (besides that of reviewing and synthesizing previous research) seems to be confined to Chapters 5 and 6, where it should be singled out more clearly.

On the whole, a reader who is very keen on becoming acquainted with the subject matter and ready to overcome the hurdles presented by the style and organization of the text will find a comprehensive coverage, ample references to the literature, and a valuable synthesis of interesting aspects in assumptional analysis. Such a reader also may find the notions and methods discussed in the monograph of potential relevance for research and practice in auditing, financial reporting, and managerial accounting.

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DAVID H. LI, *Accounting Information Systems: A Control Emphasis* (Homewood: Richard D. Irwin, Inc., 1983, pp. xvii, 590, $31.95).

This is another entry in the growing list of textbooks designed to serve the undergraduate Accounting Information Systems (AIS) course. As the subtitle suggests, a distinguishing feature of this book is its emphasis on internal control. Another distinguishing feature is the detailed explanation of seven important subsystems in a *manual* accounting system followed by a description of the same subsystems in a computerized environment. This is an efficient and effective way to teach the subject because a surprisingly large proportion of the procedures, allocation of duties, work flow, and other features of a manual accounting subsystem carryover to its computerized counterpart. A third distinguishing feature of the book is conciseness—major ideas are expressed in as few words as possible and supporting details are omitted or are presented as a list in a table.

The book is organized into five parts. Part I provides an overview of the field. Topics covered (albeit briefly) include the nature of an accounting system, the accounting cycle, responsibility accounting (including account coding), the system study process, and flowcharting (systems, program, control, and document).

Part II deals with manual accounting systems. Consistent with the emphasis of the book, it begins with a chapter on internal control. Although containing only 12 pages, it covers the objectives of internal accounting and administrative controls, organizational independence, and the controls inherent in the manual accounting process. Unfortunately, the explanation of incompatible functions is unnecessarily confused by the use of undefined and apparently overlapping terms for the functions.

The remaining chapters in Part II describe the documents and procedures used in the models of seven subsystems:

1. Sales/receivables
2. Purchases/payables
3. Cash receipts
4. Cash disbursements
5. Payroll
6. Inventory
7. Production

A separate control flowchart is presented for each transaction type included in the subsystem. While this approach divides the subsystem into small, understandable segments, it also creates three problems for students:

1. Control flowcharts explicitly portray some but not all of the processing that occurs at a workstation; system flowcharts using the standard ANSI/ISO symbols contain more information and are easier for students to understand.
2. The student will have difficulty grasping the entire subsystem and the total tasks performed by each department involved.
3. With no summary at the subsystem level, few, if any, students will be able to combine the processing depicted for 16 individual transaction types into a single accounting system, especially since the summary chapter abandons the flowchart method of exposition and substitutes a series of tables.

The last chapter in Part II integrates the seven subsystems into a single system by the use of tables which summarize the forms, journals, control totals, journal vouchers, and general ledger entries previously encountered.

Part III serves as a transition from manual to computer-based systems. One chapter contains a brief overview of computer hardware, software, recent developments, and the data hierarchy. Other chapters survey the computer planning process, starting with the appointment of a computer planning committee, and continuing with the subsequent computer implementation process.

Part IV begins with an adequate discussion of internal control in a computer-based system, followed by four chapters that describe computerized versions of the same subsystems covered earlier in Part II. All are tape-oriented batch processing systems; this limits the usefulness of the material for today's students. But Professor Li does supply detailed layouts of the magnetic files and printed reports that are very useful to the student and are omitted from some other texts.

The overall approach is to computerize a portion of the corresponding manual subsystem from Part II, leaving the rest of the activities unchanged. This often results in a very awkward or inefficient model for the students to study. For example, in the sales/receivable subsystem, the posting of the accounts receivable subsidiary ledger is computerized, but the sales invoice is still prepared manually so that the completed invoice can be used as the source document for the input data. The student must wade through the detail design of files and processing without a clear understanding of the desired end result because the *system* flowcharts are not presented until the end of each section. Another serious problem is that these chapters ignore the preparation of journals, the detection and correction of errors, and the posting of the general ledger.

Part V "explores new areas affecting accounting information systems and control." These new areas include the cost/benefit analysis of internal controls and the control implications of small computers, data base management systems, and distributed data processing.

The assignment material in any accounting text is important, but it may be even more so in a systems text. The assignment material in the Li text is adequate, but it tends to be mechanical or adapted from professional examinations and thus does not cover some major points given in the chapter. Also lacking are computerized learning aids, such as a small but realistic accounting system that would permit the student to create a chart of accounts, enter transactions in a realistic manner (i.e., not in general journal format), and see the type of outputs produced by real accounting systems.

In summary, this book is based on a good concept—explaining manual accounting systems first, then the same functions in a computer environment (including record layouts, flowcharts, and other specifics)—but its implementation is somewhat less than optimal.

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JOSEPH A. MACIARIELLO, *Management Control Systems* (Englewood Cliffs: Prentice-Hall, Inc., 1984, pp. xv, 591, $29.95).

At last a challenger is available for the long established Anthony, Dearden, and Bedford text, *Management Control Systems*. Competition can produce a clearly dominant product or can cause the consumer to make tradeoffs. Although the latter is the case, the new text clearly is worth the tradeoffs, and instructors of an advanced managerial accounting or management control systems course should try it.

The Maciariello text uses the cybernetic paradigm as the theoretical structure for the control process. By using this framework, management accounting systems are effectively placed into the broader framework of overall organization control. The management accounting system is shown to be an integral part of a larger, more comprehensive organizational control system. It is shown to be complementary to other devices such as organizational structure and the formal rewards system rather than emphasized as the primary source of control in organizations.

The cybernetic paradigm is shown to be a relevant control device at all levels from operations up through strategic planning. This perspective avoids the competitor's trichotomy of strategic planning, management control, and operating control. Those who find pedagogical merit in using the three-way partition will have to restructure their approach to the course to use this text. Though this involves considerable work, the merits of such a restructuring are quickly evident.

This textbook is appropriate for a second course in management accounting or in a first course on control systems. Students using it should have a strong background in *both* financial and managerial accounting. Additionally, the student needs grounding in the procedural and quantitative aspects of accounting control such as preparing budgets, calculating variances, and preparing segmented income statements. A solid understanding of the drawbacks of historical cost accounting and accounting allocations such as depreciation also is necessary. The procedural chapters in Maciariello (11–14) are the weakest parts of the book and do not give sufficient treatment to the prerequisite subjects. This is not a fatal criticism since the book is directed primarily to the student who has had the procedural topics.

The strengths of the book dominate this one weakness. Primary among the strengths are the integration of behavioral and ethical considerations in the control process, the treatment of the long-run consequences of the interface between decision making and control, and the previously discussed use of the cybernetic paradigm.

As to the behavioral and ethical considerations, the control process is shown to put constraints on human behavior to create a unity of purpose. The potential for abuses and dysfunctionalities is dealt with sufficiently. The trade-off of short-run gains vs. long-run gains due to control system/reward system payoffs is one dysfunctionality which receives ample attention. In fact, the chapters on ROI (Chapter 7) and Capital Budgeting (Chapter 9) treat the respective subjects as well as most managerial accounting texts. The inconsistency between making decisions on a cash-flow basis and evaluating operations on an accrual basis is made clear.

The author's writing style is terse and to the point; examples within organizations are given for many of the points. These "real life" examples reinforce the conceptual nature. The book does not place a heavy emphasis on graphics, relying only on a limited number of insightful exhibits. The cases at the end of the book tend to run the gamut from simple to complex. The instructor will have to pick and choose the ones that should be put into his or her repertoire of existing control-oriented cases.

The book comes with a solutions manual and chapter guide. This supplement is helpful in choosing cases to be assigned but the content of the solutions tends to be sparse. The competitor tends to have a more detailed solutions manual. But some instructors may prefer *not* to be led by the hand into giving the author's solution, and instead may prefer their own analysis.

Overall, the book scores very well for a second-level course at either the graduate or undergraduate level. Using the structure of the cybernetic paradigm versus the strategic planning, management control, and operating control approach requires work by the instructor. The fruits of this work are a viable competitor in an area where few competitors existed previously.

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RICHARD MATTESSICH, *Modern Accounting Research: History, Survey, and Guide*, Research Monograph No. 7 (Vancouver: The Canadian Certified General Accountants' Research Foundation, 1984, pp. xviii, 487, Can. $30.00 paper).

The objective of this volume is to provide an overview of, and to serve as a guide to, contemporary accounting research. It is a collection of 21 articles by a number of prominent accounting researchers. Five of these are published for the first time. The rest bear publication dates from the late 1970s and early 1980s.

The readings are organized into six parts. Part I (General Introduction) sets the stage with an article by Professor Mattessich. In it, he makes the case for viewing accounting as an applied science—a science because of its methodology, and an applied one because of its goal orientation. Based on this view, Professor Mattessich emphasizes that accounting research must be based on a rigorous methodology and must be guided by a normative and teleological prospect. The remaining readings are organized around this theme into five parts, each prefaced by an overview to put the topic in perspective.

Part II (Evolution or Revolution of Modern Accounting Theory?) places the current state of accounting research in historical perspective. Articles by Professors Mattessich and M. C. Wells propose ways of viewing recent developments in accounting research. An article by Professor N. H. Hakansson then discusses how accounting research has been influenced by "imports" from economics and finance. The final article, also by Professor Hakansson, critiques the American Accounting Association's *Statement on Accounting Theory and Theory Acceptance* (1977). This discussion is a useful guide to the issues in developing a general theory of accounting.

Part III (Positive Versus Normative Accounting Theory and Standard Setting) provides more specific examples in the development of contemporary accounting research. It starts with two influential papers by Professors R. L. Watts and J. L. Zimmerman on the "positive theory" of accounting and the market for accounting theories as excuses. A critique of the Watts and Zimmerman approach is then provided in an article by Professor C. Christenson. Finally, an article by Professors M. J. Bryant and D. B. Thornton, and one by Professor S. Sunder and Mr. S. Haribhakti, elaborate on the various interested parties and forces that affect accounting standard setting.

Part IV (Agency Theory and Information Economics) contains three excellent articles on the application of agency theory and information economics to accounting research. Professor G. A. Feltham, in an article written for this volume, gives a comprehensive survey of various developments in information economics and their significance to financial accounting research. Professors J. E. Butterworth, M. Gibbins, and R. D. King illustrate the role of agency theory in the further development of accounting theory. The final article in this part, by Professor S. Baiman, is an extensive and insightful discussion of the application of agency theory in managerial accounting.

Parts V and VI (Empirical Accounting Research and Managerial and Institutional Accounting and Auditing) are primarily surveys of practice or available empirical evidence. A total of eight articles cover areas including non-business accounting, audit decision making, and financial and managerial accounting. Different research approaches, including experimental and survey research and the study of security prices, are covered. Hence, these two parts should provide an appreciation for what has been learned about different areas of accounting, the major issues that remain, and the available tools for dealing with them.

The target audience for this volume is practitioners, students, and academics. While the three groups probably will not benefit to the same extent, they all should find this book useful. Practitioners and nondoctoral students are likely to find some of the readings, especially in Parts III and IV, challenging and perhaps difficult to appreciate. But the mix of readings will permit them to get an overall feel for the state of accounting research. Doctoral students and academics should find the entire volume useful and give it a thorough reading. While some of the survey articles may be a little dated, and some areas such as tax research have been omitted, the volume as a whole provides a particular perspective on accounting research. Those students and academics who have not yet developed their own perspective will find this a useful aid to their developmental efforts. Those who already have developed their own, and perhaps different, perspective will find it useful to reexamine their views in light of the perspective promoted here.

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WAYNE J. MORSE, JAMES R. DAVIS, and AL L. HARTGRAVES, *Management Accounting* (Reading, MA: Addison-Wesley Publishing Co., 1984, pp. xx, 754, $29.95).

This text is intended for a one-quarter or one-semester introductory managerial accounting course. The authors' stated intent was to make it "relevant, flexible, clear, and accurate" (p. vi). On the whole, they have succeeded. The book clearly is targeted for that vast middle-ground of managerial accounting texts in general and the Garrison text in particular.

The text comes with a full range of supplemental materials, including a solution manual, study guide, test bank, transparencies, and a checklist of key figures. The solutions manual is far more error-free than most, an indication of the care with which the package was assembled. The writing style generally is simple and straightforward. The graphic design uses a subdued second color for emphasis and exhibits, and it is both attractive and effective.

The end-of-chapter problem material is not as diverse as it might be. The level of difficulty of most problems is fairly uniform, with most capable of being solved by reference to text examples. This creates a certain level of student satisfaction, but a price is paid for that result. The authors deliberately designed redundancy into the problem sets to accommodate multiple sections; thus the total number of problems available is not an accurate measure of the variety available. Instructors will find the construction of parallel assignments to be relatively easy, but may have more difficulty with the lack of diversity.

The book is organized into four sections containing a total of 17 chapters that include all the standard topics found in the typical managerial accounting text. The first section is part overview, including a broad-brush treatment of product costing, and part decision-related material. The second section contains planning and control topics, and the third section consists of a two-chapter coverage of product costing. The final section appears to be designed to make certain that all bases are covered and that the text will mesh with a variety of introductory financial texts. Most of the chapters are written so that they may be covered in an order other than that presented.

The authors have attempted to solve the problem of the appropriate level of product costing coverage, but have only partially succeeded. Product costing has a necessary place in a managerial accounting course, if for no other reason than that it provides one of the outputs of costing systems. More importantly, the financial accounting/product costing mental set pervades external accounting reports and the perception of problems, even when the concern is purely internal. The only way for a user to gain a measure of self-protection is to experience how the full costing rationale introduces unmeasurable bias into numbers that one might be tempted to use for another purpose, e.g., decisions or performance evaluation. The point has to be made over and over, since cost allocations have a surface plausibility. As one example, the authors miss their chance in this area by considering only the product costing side of the joint product case, and providing no discussion or problems involving decision-making. Chapter 4 of Horngren's *Cost Accounting . . .* (Fifth Edition) is perhaps the best available introduction to product costing. By not considering beginning inventories, Horngren is able to avoid the weighted average-FIFO distraction, and students are able to see and appreciate the allocation issues. Managerial text writers might well learn something from that treatment.

In areas that border on the quantitative, the coverage and treatment is somewhat soft. The authors seem confused about the difference between using linear algebra and using a simple process of substitution to solve simultaneous equations. The appendix dealing with least-squares estimates of cost functions is not unlike that found in other similar texts, which is to say, it is inadequate. Having students go through a manual computation of parameter estimates using normal equations is much like teaching them to compute square roots manually; no one does it that way anymore. Moreover, nothing in that computation process increases understanding of the subject. Thus it is simply busywork that may have the undesirable side effect of frightening many students who panic at the sight of a summation sign. Such a result is unfortunate since this material can be presented in an entirely intuitive way that permits at least a moderate understanding of the output of statistical packages and of the underlying problem.

Despite the inevitable disagreements that a reviewer may have with any text, this book should become a major competitor in the undergraduate managerial accounting market. The authors have shown a commendable respect for those who will use this book by the obvious care that has been taken to prepare the text and supplementary materials. Having suffered through too many sloppily prepared textbooks, they are indeed to be complimented for their efforts.

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STEPHEN A. MOSCOVE, *Accounting Fundamentals for Non-Accountants*, New and Updated (Reston: Reston Publishing Co., Inc., 1984, pp. xiii, 397, $16.95 cloth, $10.95 paper).

This book is appropriate for courses designed for nonaccounting majors at either the undergraduate or graduate level. The emphasis is on understanding accounting principles and procedures as they relate to the overall understanding of financial statements. The focus is appealing to nonaccounting majors who often are not interested in mastering all the details of accounting procedures but need to gain an understanding of financial statements.

The topics covered are similar to those in a traditional introductory financial accounting text. The first chapter introduces financial statements, their importance, and the relationships between them, as well as basic accounting concepts. This chapter stimulates interest in accounting while providing a framework for the material that follows. The accounting cycle is introduced in the next two chapters, followed by five chapters categorized as financial statement analysis which deal with individual balance sheet items and related income statement topics. Partnerships and corporations are introduced in separate chapters.

Several changes distinguish this from the first edition. New materials include a discussion of the use of computers and accounting systems in the accounting cycle chapter and an introduction to the Accelerated Cost Recovery System in the long-term assets section. The major change is the format of the text. This edition is written in a self-instructional format that makes the book usable either in a traditional classroom setting or in a programmed self-study situation.

Each chapter begins with a set of learning objectives that clearly identify the concepts to be mastered. One-sentence statements highlighting the important material are presented in the margins of each page. The author uses illustrations and charts effectively throughout the text to greatly enhance the understandability of the material. Examples are interesting with an inherent non-technical logic that makes accounting concepts understandable to non-accounting students. Short questions, with answers, are interspersed throughout the chapters again in the self-instructional framework. The writing style is refreshingly clear and the explanations are well done throughout.

At the end of each chapter are short questions and one summary problem that focuses on understanding the specific topic material in a financial statement setting. Solutions to the questions and problem are provided. The major drawback of the text is the limited number of problems at the end of each chapter. Many of the topics are complex and although the summary problems included are comprehensive and well done, additional exercises would help the students in mastering the material. This shortcoming is somewhat compensated for since the final chapter is devoted entirely to a comprehensive review problem—another new feature of this edition. This problem takes the students through the entire accounting cycle as presented in the first 11 chapters. It is an excellent summary for the course and is similar to a short practice set in concept and detail.

This book presents a well-written self-study approach to accounting for nonaccountants. Emphasis on financial statement analysis and accounting concepts gives the blend of procedure with practical application necessary for this type of course and will provide an excellent introduction to accounting.

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KENNETH S. MOST, *International Conflict of Accounting Standards: A Research Report*, Research Monograph No. 8 (Vancouver: The Canadian Certified General Accountants' Research Foundation, 1984, pp. x, 88, Can. $16.00 paper).

This monograph deals with a controversial and yet important issue in transnational financial reporting: the conflict of accounting standards among countries and its consequences. While the study is concerned with the problem of conflicting accounting standards in an international perspective, it focuses on Canadian companies and Canadian and U.S. GAAP. The methods adopted include a literature review, questionnaire surveys of accountants and financial analysts, and content analysis.

Four hypotheses were investigated in the study. On the first hypothesis, Professor Most has successfully demonstrated that generally accepted accounting principles differ from country to country and have not yet been effectively harmonized internationally. In Chapter 1, four types of accounting differences were discussed: (1) conceptual, (2) valuation, (3) form of presentation, and (4) degree of disclosure. Examples of these differences were provided. The move toward harmonization was discussed in Chapter 5. He noted that efforts to harmonize accounting standards worldwide in the past have not resulted in narrowing accounting differences among countries. Ironically, the voluminous pronouncements issued by national accountancy bodies and international organizations have created another serious problem known as "standards overload."

Failure to follow one prescribed set of accounting standards by a reporting entity may reduce the usefulness of its financial statements. In his second hypothesis, Professor Most hypothesized that this fact was recognized by both the producers (accountants) and users (financial analysts) of financial statements. The results from the questionnaire surveys indicate that a majority of the accountants and financial analysts surveyed were aware and concerned about the conflict of standards problem. But given the low response rates to the surveys and the non-random nature of sample selection, the results should be treated as tentative.

In Chapter 4, Professor Most provided interesting empirical evidence of conflict situations in a Canadian-U.S. context. The annual reports of 14 Canadian companies with substantial foreign operations were reviewed for years ending in 1980 and 1981. In addition, consolidation of a Canadian subsidiary (Imperial Oil) by a U.S. corporation (Exxon) also was examined for the years 1979 and 1981. The evidence provides support for the third hypothesis that financial reports sometimes utilize GAAP promulgated in countries other than the country of incorporation. As the author stated, "This is particularly true for a Canadian company having security holders in the United States and which is able to rely on the acceptability of U.S. GAAP in Canada as justification for selection among accounting standards" (p. 59). In addition, some evidence supports the fourth hypothesis that financial statements prepared for publication in more than one jurisdiction sometimes fail to make clear which country's GAAP has been followed.

In Chapter 5, Professor Most examined a number of proposals to resolve the problem of international conflict of accounting standards. None of the proposals reviewed were found to be satisfactory. Even though the author failed to provide a practical solution to the problem, several of his recommendations may help eliminate some confusion in transnational financial reporting. His last recommendation stated that "[a]ccountants should abandon their preoccupation with the measurement of net income and direct themselves to the provision of information useful for economic decisions" (p. 76). If this recommendation is implemented in an international context, it should help expand a new frontier of accounting: international management accounting.

In the monograph, the author has achieved his primary objective of exploring "the subject of conflict of accounting standards, with particular reference to the experience of Canadian companies reporting in an international environment" (p. 1). The book represents a valuable addition to the expanding literature of international accounting and could be useful as a supplement in an international accounting course.

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James W. Pattillo, *Quality Control and Peer Review: A Practice Manual for CPAs* (New York: John Wiley & Sons, 1984, pp. xviii, 301, $39.95).

The public's response to highly publicized audit failures in the business and financial press in the late '60s and '70s was to question whether the accounting profession was meeting its responsibility for performing the attest function. This eventually led to a congressional investigation of the profession. Being determined to preserve self-regulation, the profession took several measures to improve audit quality and enhance the public's confidence. A major thrust of this effort was the establishment of the Division for CPA Firms in 1977. Membership in the Division reached approximately 2,000 firms in the first year, peaked at approximately 2,500 firms, and is currently about 1,630 firms. Membership in the Division requires firms to have a formalized quality control system for their accounting and auditing practice which is documented by a quality control document. Also, the member firm must undergo a peer review every three years. Approximately 85 percent of all public companies and those having 98 percent of the sales volume of all firms listed on the major stock exchanges are audited by division members. The profession's leadership and regulators like the SEC have been somewhat concerned about why more firms have not joined the Division. Basically, it comes down to a cost-benefit decision for the CPA firm. Is the cost of joining the Division, establishing the quality control system, having a peer review, and documenting day-to-day practice so that it can be reviewed by external peer reviewers, worth the benefits?

The purpose of this book is to help CPA firms create and maintain a formal quality control program. The author states in the preface that "[q]uality control is essential for the long-range life and profitability for a firm and is required by professional standards." Chapter 1 starts by explaining the benefits to the firm of establishing a quality control system. It explains the professional standards that require the CPA firm to have a quality control system. Unfortunately, many CPA firms don't realize that such professional standards exist. Instead, they believe that quality control systems are only for members of the Division for CPA Firms. In the remainder of Chapter 1 and Chapter 2 the author describes the Division for CPA Firms and the peer review structure. In Part 2 of the book the author presents a model of how to establish a quality control program. The model explains first how to define the task and get started. This includes advising the firm that it might consider hiring an accounting professor to help do the work. This sounds like a good idea! It also explains the types of changes that might be necessary in the CPA firm with variations that depend upon the firm's current system and how different documentation might be required so that outside peer reviewers can be satisfied that the work was done. Probably most practitioners would like to have more information on the type of documentation that the author discusses, such as example forms, rather than just the statement that new forms will have to be devised. The author also gives suggestions on how to organize for the quality control task, to document quality control policies and procedures, and to document the nine areas of quality control.

In Part 3 of the book the author tells how to maintain a quality control program. Advice is given on managing an accounting practice, and some examples are used for documentation of various aspects of this process. Chapters on maintaining a professional education program and maintaining the inspection program are presented with detailed advice given to the firm on various aspects. Since the idea of an inspection program is relatively new to the profession, this chapter should be of considerable interest to a new member of the Division.

Part 4 of the book presents advice on how to prepare for an external peer review. It explains the process that the firm will have to undertake. Since the uncertainty about the review process seems to be a factor that keeps many firms from joining the

Division, this section of the book should be of considerable interest to prospective members.

Part 5 of the book presents three chapters on the process of administering a quality control program. This part is concerned basically with describing such aspects as the profession's program and the rules for membership.

Overall, this book presents a comprehensive description of the profession's quality control program. It describes what the firm should expect if it decides to join the Division. Most AICPA publications on peer review and the Division are cited and/or described, but few references are made to the accounting literature on the subject. Presumably, the author believes that practitioners would not make much effort to review the literature. Since the profession's leadership has been concerned about declining membership in the Division and the lack of interest by potential members, the author could have spent more time presenting information to help the firm analyze the costs and benefits of membership. In this area the literature does provide some helpful information to the CPA firms facing the decision of whether to join the Division.

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WILLIAM E. PERRY, *Improving Audit Productivity* (New York: John Wiley & Sons, 1984, pp. ix, 305, $39.95).

Can a set of principles that so transformed the meaning of "Made in Japan" be adapted to internal auditing? Yes, asserts Perry in this book written for persons with significant management responsibilities for the internal auditing function. It is not a textbook covering internal auditing processes, but rather is a guide to organizing (or reorganizing) and managing the audit function with the goal of increasing audit productivity. In the preface Perry attributes much of the material in the book to the work of W. Edwards Deming, who introduced quality control principles to Japanese industry. Although Deming is a recognized hero in Japan (e.g., he was decorated by the Japanese Emperor with the Second Order Medal of the Sacred Treasure [*Iron Age*, October 6, 1980, p. 51]), he apparently has written very little, and instead has communicated his knowledge mostly through seminar presentations. In any event, Perry makes no reference to any Deming publication. In fact, the book makes no reference to any published research or any other authority. Thus, readers must rely on the authority of the author, whose credentials in internal auditing and quality control certainly are meritorious.

At the heart of the book are ten principles of productivity. These apparently have been adapted from Deming. After a chapter which presents the building of a productivity plan, these principles are presented as guides to implementation. Each of the ten principles is the focus for a chapter, and each chapter follows a consistent organizational outline.

After a short concluding chapter, three appendices are presented. Two of these seemed particularly interesting.

One is a summary of both the history and the attributes of quality control circles that Perry recommends for the internal audit group. Quality control circles apparently were developed in Japan as a consequence of Deming's work.

The other is a summary of 21 measures of audit productivity that Perry calls "auditing metrics." Examples include:

—Audit benefits/audit costs.
—Audit costs/number of audit findings.
—Recommendations accepted/recommendations made.

This book is written as a guide to organizing and managing an internal audit function, and it does not purport to be a textbook or a research study. It is well organized and easy to read and should be quite useful to the experienced audit manager who can judge the quality of the author's assertions. It also would be a worthwhile addition to the university library, particularly as a reference work to support an internal auditing course. Furthermore, the work may well inspire auditing researchers to consider the applicability of quality control principles to aspects of auditing. Certainly, many researchers and auditing practitioners are wrestling with the issue of "better work at less cost."

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RESEARCH ADVISORY COMMITTEE, *The Institute of Chartered Accountants of Scotland: Research Conference October 1983—Discussion Papers and Commentaries* (Edinburgh: The Institute of Chartered Accountants of Scotland, 1984, pp. ix, 135, £4.75 paper).

These are the proceedings of a conference whose objective was the promotion of better understanding between academic researchers and the accounting profession. The invited audience of 45 included 11 full-time academics from Scotland and the North of England.

The first of six sessions was contributed by Professor David Tweedie of Thomson McLintock & Co., who identified a lack of communication as the main barrier between researchers and practitioners. More controversially, he suggested that communication with the "coal-face" practitioners is always going to be difficult; a better target for academic researchers would be the profession's "policy-makers," whom he identified as the technical directorates of professional bodies and large firms of accountants, with their counterparts in major corporations, plus the standard-setting agencies.

Certainly, the contributors of the remaining sessions made brave attempts to set out the implications for practice of the principal lines of research activity, in terms which a non-academic might understand. Original contributions to knowledge are not to be expected from such an occasion, but academic readers will do well to study these papers, if only to see the problems of such an undertaking.

They would do even better, however, if they read the commentaries of the official discussants, who were drawn exclusively from industry. These seem very flat to those accustomed to the gusto with which Anglo-Saxon (and even Scot) academics hurl themselves upon each other's work. Indeed, the commentaries scarcely grapple with the ideas presented in any significant detail, or even miss the point altogether. For example, the discussant of a paper on "The Relationship between Accounting Information and Security Price Behaviour" seemed to believe that some reaction *would* be observable, if corporations would only disclose their insolvency "z-scores."

But these strictures cannot be applied to the discussant of Professor Tweedie's paper; if it is true, what he said goes a long way towards explaining the rather baffled reactions of the other discussants. He claimed to see this "failure of communication" as proceeding from the failure of both academics *and* the policy-makers to address themselves to the real problems encountered by their profession "at the coal-face." Indeed, he doubted whether any of the pleasant people listed by Tweedie really understand what are the day-to-day concerns of professional and industrial accountants.

Hard words, especially since he did not tell us precisely what these real coal-face problems might be! Nevertheless, one has an uneasy feeling that all too many researchers and policy-makers (as defined) do, for one reason or another, proceed on the basis of a grossly oversimplified model of accounting *practice*. More than one of the discussants observed how the rather normative prescriptions of the paper fail to take account of the political arena in which accounting must function in practice.

This booklet is worthy of a place in a reference library, for the reasons set out above. Probably most doctoral candidates ought to read it as they prepare the proposals for their programs of research. Relations with the coal-face could be improved if researchers would ask themselves whether their real concern is with professional problems *per se*, or whether the heart of their work lies in econometrics, decision theory, information economics, and the like.

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JOHN E. ULLMANN, Editor, *Social Costs in a Modern Society: A Qualitative and Quantitative Assessment* (Westport, CT: Quorum Books, 1983, pp. xiv, 268, $29.95).

This book will appeal to many accountants because of its focus on the problem of measuring social costs. For accountants who stress the measurement aspects in characterizing their discipline, this book offers several salutory lessons—some of which are envisaged by the book's contributors and others which are not!

Social costs fall into three types for Ullmann and his colleagues: losses suffered by a party who is otherwise external to a transaction (an externality); transfer payments or subventions from one sector of the community to another (for which nothing is given in exchange); and opportunity loss to society resulting from suboptimal "private" transactions (e.g., socially uneconomical automobile-based urban transport systems). The three notions of social cost are applied to measuring such costs as those of slums, poverty, industrial pollution, industrial accidents, drug addiction, energy generation and distribution, military expenditures, the arms race, unemployment, and old age.

The book was assembled by John Ullmann from a selection of Hofstra University MBA theses. The result is a well-edited volume, representing what must have been enlightening educational experiences for MBA students. Several contributions make good reading: an account of court practice in establishing damages for fatalities and injuries; a historical perspective on poverty and slums; a paper on the duplication of capital facilities (especially transportation); and John Ullmann's treatment of military expenditures and the arms race, as instances of social costs and waste.

The shortcomings of the work arise from its narrow conception of the primary research task in social costing: to find more precise measures of social cost. Many accountants would sympathize with such a priority and thus it may be instructive to examine how this book fails because it attempts to develop "social cost measures" independently of a "social theory."

The three-part definition of social cost is reiterated in several places in the book with little discussion and critical evaluation. This definition leads to two anomalies: First, as illustrated in the discussion of slums and poverty, "social" costs are based, not on misery, hardship, and deprivation, but on the money paid by third parties (usually through the state) to sustain the disadvantaged. Second, social costs are one-way exchanges—like philanthropy or charity—where the wealthy make payments and supposedly get nothing in return. For Ullmann, a social cost has two implicit, yet defining characteristics: a money transfer, one that is unrequited. These characteristics also apply to an externality, from which Ullmann largely derives his notion of a social cost.

Ullmann's notion of a social cost gives rise to some difficulties. If no money transfer occurs—if society terminates payments to the unemployed, slum dwellers, the sick, and the disabled—can one conclude that social costs do not exist? Those of a right-wing political persuasion might find this conclusion agreeable, but it would seem unlikely to please Ullmann, et al.

The unrequited exchange characteristic of Ullmann's definition also raises some difficulties. The treatment of the social cost of unemployment exemplifies the point: this cost is estimated in terms of the societal production lost by having people unemployed (pp. 105-120). Yet, with over 30 million people unemployed in O.E.C.D. countries and many more in the "free" third world, full employment is not a "real" option that that society is "giving up." Indeed, some argue that a little unemployment is beneficial because a pool of unemployed restrains the claims of labor, and assists capital in reproducing itself.

Given this scenario, are unemployment payments really unrequited exchanges—externalities—imposed on the more fortunate, for which they receive nothing in return? If a little dose of unemployment is indispensible for making capitalism work, then it constitutes a reciprocal exchange for unemployment benefits, and thus, according to Ullmann's own definition, unemployment benefits cannot be social costs. The valuable stabilizing function of the unemployed is secured with cheap palliatives of welfare and dole money; far from being a "cost" to society, unemployment benefits are a real bargain!

Ullmann, et al. assail measurement questions in an atheoretical manner, giving little attention to the purposes served by social costing, the rationale underlying their definition of social cost, or the assumptions that this implicit rationale entails. A crucial assumption concerns the nature of the society and the relations between disadvantaged and advantaged groups. Ullmann's assumptions here correspond with those of neoclassical economics (and most accounting theorizing): they are asocial in that they regard people as though they were socially unstructured—like social atoms—that enter the world as free and equal beings. Structural advantage and disadvantage are ignored by this vision of the world, and thus, when some social members "fall on hard times," they do so by their own volition; any payments made to relieve their hardship are construed as unreciprocated acts of charity and benevolence. But equally plausibly, we might view such payments as the price of defusing protest and disorder, as the cost of buying peace in an unequal and discriminatory social order.

This alternative perspective of society implies a new view of "social" cost, one that is no longer limited to cash outlays, but is theoretically informed with notions of social structural inequality and institutional oppression. To date, most social accounting has successfully avoided thinking about such issues.

Ullmann and his colleagues exhibit clear humanitarian sympathies; unfortunately, like many well-meaning liberals, they never draw on the extensive literature in Critical Theory and radical economics that might help to articulate their sympathies. By approaching measurement problems in an atheoretical fashion, this book offers a fascinating array of facts which, at best, are ambiguous and, at worst, perpetuate the liberal myth of equal opportunity. Worse, we are in danger of debasing social and public interest accounting to keeping-the-tab of impositions on the endlessly generous rich, that support the base pleasures of hordes of idle, sponging, malcontent unemployed. Such are the dangers of ascetic, rigorous, mathematically precise—yet asocial—approaches to measurement.

This book would be useful in doctoral studies and research seminars and as a supplement in social policy and social accounting courses—in the latter its question-stimulating content could give it a stronger, more complementary role. It also could be a useful antidote to financial accounting textbooks.

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THE ACCOUNTING REVIEW
Vol. LX, No. 4
October 1985

CAPSULE COMMENTARIES

Harvey S. Hendrickson, Editor

W. STEVE ALBRECHT, KEITH R. HOWE and MARSHALL B. ROMNEY, *Deterring Fraud: The Internal Auditor's Perspective* (Altamonte Springs: The Institute of Internal Auditors Research Foundation, 1984, pp. xvi, 169, $33.00).

This book reports on a study sponsored by the IIA Research Foundation to investigate the motivations for committing fraud and to identify the most important "red flags" (warning signals) that were perceived to be related to a large sample of actual fraud cases. The impetus for the study was the awareness that employee fraud is a significant and growing problem for business that results in material economic losses over time. The general purpose of the study was to examine the information content of fraud-related factors. The specifically stated objectives were to provide information on:

1) the type of employees that commit fraud;
2) their motivations for perpetration; and
3) actions and controls that can be taken to deter and detect its occurrence (p. xiii).

The authors intended to accomplish these objectives by analyzing "the red flags and ranking them according to their perceived and actual importance in detecting and deterring fraud" (p. 12).

The discussion of the study is practitioner-oriented; it makes use of narrative explanations and extensive presentation of frequency tables or ranking tables based on significant correlations.

The book is divided into two parts. Part 1 reports the introduction, framework, results, and conclusions of the study. Part 2 provides 143 of the 212 cases reported by internal auditors. Although data are missing from many of the cases, the information is rich enough to provide insight into a variety of fraud cases. This may be very useful to educators for developing practice cases or experimental materials for the study of internal control and fraud.

The method of the study included: (1) identifying companies (by contacting internal auditors) that have experienced fraud and are willing to participate in an extensive survey ($n=325$); (2) having these internal auditors self-report the fraud case as to recalled facts, outcomes, and reasons for the crime ($n=212$); and (3) having the internal auditors respond to a survey which required the subjects to relate the occurrence of red flags to the reported fraud case and to fraud in general.

The section reporting the results of actual and perceived importance of factors related to fraud is somewhat misleading in that the authors infer that the factors related to the specific cases are factual data, whereas they should be interpreted as perceptions of the internal auditors in relation to a specific fraud case. Additional data reported in this section are related to the accessibility of the red flag data motivators. The findings implied that the perceptions of important perpetrator characteristics were the type of data that normally could not be collected by internal auditors (e.g., living beyond one's means or gambling habits). Inconsistencies also showed up in the data. For example, in one part of the survey the motivational factors that were ranked important were identified in another part of the survey as having no informational value (if known) in identifying potential fraud perpetrators. The perceptions of the important control environment factors which allowed the opportunity of fraud are the primary weaknesses one would expect in a poor control environment. These include: (1) lack of authorization, (2) no segregation of duties, and (3) too much trust in a key employee. Other findings reported that: (1) collusion was involved in a minority of the cases; (2) management override was not a frequent problem; and (3) internal auditors were rarely the ones who detected the fraud.

In summary, the authors conducted an interesting descriptive study of fraud but, primarily due to the weakness of the survey, the authors did not satisfy their objective of providing internal auditors with tools to help detect and deter fraud. Since most of the predictor factors are unobtainable, internal auditors would be treading a thin line in trying to predict whether a particular individual was a fraud perpetrator based on the results of this study. Since little research has been conducted in this area, this study may provide a reasonable starting point in developing models for future studies in detecting and deterring fraud.

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Robert N. Anthony and David W. Young, *Management Control in Nonprofit Organizations*, Third Edition (Homewood: Richard D. Irwin, Inc., 1984, pp. xvi, 680, $30.95).

The first edition of this book was a pioneering effort in an area where no textbooks previously existed; a primary change introduced in the revised edition (reviewed January 1981, pp. 204–205) was the addition of cases. The most significant change noted for this third edition results from the replacement of the second author. Both are Harvard professors, but Regina Herzlinger was in the Graduate School of Business Administration while David Young is in the School of Public Health.

The change in perspective precipitated by this is best illustrated by the cases. This edition introduces 36 new cases while retaining 12 from the second edition. Professor Young authored or directed the preparation of one-third of the 48 cases and, furthermore, approximately one-half of all cases now involve health-related organizations. The addition of the new cases allows the user to narrow the focus of a course from the general "nonprofit" to a more specific subset such as "health care" if desired. Although some material has been rearranged, the other primary change is the inclusion of two new chapters—one on financial statements and another on cost accounting. The addition of these chapters is useful, but does not alter the fact that this is a text on management control and not accounting, and should be used accordingly.

An instructor's guide is available. It contains a brief but informative discussion of the case method of teaching, provides "teaching approaches" to the various cases, and suggests cases that the authors have found useful for examination purposes.

The changes in this edition, principally the expanded number and breadth of cases, should allow this text to continue as a leader in the public sector management control area.

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Brian Armitage, *Business Expansion Scheme* (London: The Institute of Chartered Accountants in England and Wales, 1984, pp. xiii, 192, £8.95 paper).

The Business Expansion Scheme (BES) of the Finance Act 1983 (United Kingdom) is explained in-depth and contrasted to its predecessor, the Business Start-Up Scheme (BSS) which focused on incentives for new companies. The BES extends investment incentives to existing unquoted companies by providing the immediate write-off of £500 to £40,000 investments in the stock of qualifying companies by eligible taxpayers. The law has many complexities designed to limit its use to the specifically targeted trades by taxpayers who do not already have substantial connections to these companies. The author refers to the BES as "an intricately engineered mechanism designed to be the vehicle for financing growth in the unquoted trading company sector" (p. 61).

To fully benefit from the book's discussion of the BES, the reader needs some acquaintance with the British schedular system of taxation and the relevance of April 5th to tax determination. Lacking that, the reader can still gain an appreciation of the complexity which surrounds a seemingly straightforward equity investment incentive. The only similar equity investment incentive available to U.S. taxpayers is the ordinary loss treatment afforded Sec. 1244 stock; but this only provides relief some time after investment when the stock proves worthless or is sold at a loss. The BES provides incentives at the time the investment is made. Much of the complexity enters the law then because the investment must remain for at least five years and the initial qualifying conditions must be adhered to throughout this investment period to avoid the extensive recapture provisions.

This book should be of interest to the serious student of tax incentives and reform. It superbly illustrates the principle that the more limited the target of a tax provision, the more complex must be the rules required to implement it.

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Edouard Chambost, Translated by Peter Walton and Margaret Thompson, *Bank Accounts: A World Guide to Confidentiality* (Chichester and New York: John Wiley & Sons, 1983, pp. xii, 322, $31.95).

For years, many have attempted to open bank accounts and maintain funds in countries commonly known as "banking havens" for various reasons (e.g., avoiding currency exchange controls, searching for security, avoiding taxes, etc.). A "banking haven" is defined as "a country in which the degree of banking secrecy available to individuals and legal entities is much more extensive than in other countries" (p. x). This book provides a comparative description and analysis of the banking secrecy available in various countries. It also categorizes the countries offering banking secrecy into groups having similar characteristics.

Before examining the individual banking havens, the author discusses several topics related to the concept and uses of banking secrecy; these include the legal history of banking secrecy, instruments used to accommodate banking secrecy, and the politics of banking secrecy.

International banking secrecy started in the aftermath of World War I in the wake of exacerbating national exchange controls and certain countries offering valueless pieces of paper in exchange for goods and services (p. 5). In 1934, Switzerland incorporated its traditional banking secrecy into law to avoid the abuses of the Gestapo. Such a move was considered necessary to protect clients, bankers, and employees against the actions of foreign powers. Since then, other countries with banking secrecy have adopted similar policies. An interesting aspect of this book is the reproduction of some documents that illustrate banking secrecy (e.g., those relating to numbered accounts and accounts under assumed names).

Most of this book is devoted to describing the various banking havens relative to economic situations, population, stability, communications and legal systems, currency and exchange controls, banking systems, banking secrecy, techniques of banking secrecy, taxation, international agreements, and financial markets. The author summarizes this information in tabular form, which enables the reader to quickly review and compare various banking havens. The final sections include a glossary, a bibliography, and an index.

The author has substantially accomplished his stated objective of explaining and describing various banking havens and the form of banking secrecy available in different countries. But some parts of the book do not read smoothly and seem somewhat awkward. This may be due, at least in part, to the translation from French to English. Nevertheless, this book would be of interest to a broad spectrum of readers including investors and bankers, and it would be a valuable library reference book for international banking and accounting courses.

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F. L. CLARKE, *The Tangled Web of Price Variation Accounting: The Development of Ideas Underlying Professional Prescriptions in Six Countries* (New York: Garland Publishing, Inc., 1982, pp. xix, 444, $55.00).

This book is a revision of Clarke's Ph.D. dissertation at the University of Sydney. It explores the ideas underlying the studies, papers, drafts, reports, and standards that have been issued on accounting for inflation by and for the professional accounting bodies in Australia, Canada, New Zealand, South Africa, the United Kingdom, and the United States, and by the International Accounting Standards Committee.

Clarke argues that none of the prescriptions in any of these many documents and reports have contained a mechanism for incorporating "the indisputable financial (effects) of inflation (into). . . published financial statements" (p. 1).

He develops six underlying propositions that he maintains explain the failure of inflation accounting. At the core of these are (1) the treatment of changes in specific and general prices as being unrelated; (2) the implicit assumption that purchasing power is related only to money, and thus, that vendible physical assets have no purchasing power significance (he calls this the "non-monetary trap"); and (3) the consequence of the "non-monetary trap" of not recognizing in the accounts the specific power of vendible assets to purchase money that leads to an inability to measure the general purchasing power consequences of holding physical assets.

Although still written in a tedious, redundant style often encountered in dissertations, this extensively researched book, its propositions, analysis, and conclusions merit further study and should be of interest to most accountants. Thus it should be added to libraries for research and reference use.

H.S.H.

G. W. DEAN and M. C. WELLS, Editors, *Forerunners of Realizable Values Accounting in Financial Reporting* (New York: Garland Publishing, Inc., 1982, pp. xxvii, 320, $45.00).

This book of readings contains two introductory pieces and 32 articles, excerpts from books, selections from court cases, editorials, and editorial letters that have been assembled as recurring historical evidence of market/selling/realizable values being considered significant in the estimation of income/profit and financial position. The earliest piece is an introduction to a book on Italian bookkeeping published in London in 1735 and the last is a 1981 article by T. A. Lee from *Accounting and Business Research* on "Reporting Cash Flows and Net Realisable Values." In between are many pieces that are familiar to students of income accounting; these include excerpts from books by Cournot, Paton and Stevenson, MacNeal, and Simons and articles by Haig, Philips, and Sterling. Other pieces will be less well-known than their authors; included here are those by Berle, Fisher, Mills, Viner, and Chambers.

This volume has a number of deficiencies. One is that the reading on several pages is very difficult due to the uneven, incomplete reproduction of many sections, often those with the smallest type. A second problem is the carelessness in the editing and/or scholarship in the table of contents, bibliography, and especially, in the second, more specific, introductory piece where errors abound (e.g., all citations to quotations, paraphrases, and articles that appear after page 117 are off by from three to seven pages; and the names of the coauthors of one piece are transposed). Although numerous, these flaws are not fatal to the volume as a whole and should not be troublesome to most readers.

This collection of pieces from a wide range of sources supports the use of exit values as valid, reliable inputs to the accounting process on grounds that they are relevant to a wide variety of internal and external decisions and decision makers. It could be useful as a supplementary reference or reserve book for graduate seminars in financial accounting. Because of its cost, this book is likely to be most attractive to libraries.

H.S.H.

Financial Reporting for Credit Unions: A Research Study (Toronto: The Canadian Institute of Chartered Accountants, 1984, pp. xix, 106, Can. $17.50 paper).

This research study deals with the accounting and auditing issues that are unique to credit unions in Canada. The primary objectives are to (1) identify major differences in financial reporting and provincial statutory requirements, (2) consider the applicability of *CICA Handbook* recommendations, and (3) promote more uniformity by developing a model for financial reporting. The CICA study group has done a very thorough job and has accomplished its primary objectives.

The study consists of 16 chapters, a foreword, and a summary of conclusions. The first three chapters delineate the objectives and scope of the study, and the development and current financing reporting of credit unions. It shows a surprising diversity of current accounting practices and provincial statutory requirements.

Chapter 4 lays the groundwork for identifying the accounting principles for credit unions by reviewing the definition of accounting and accounting principles, the development of generally accepted accounting principles, and the objectives of financial statements (p. 13). While this review is too brief and elementary, it is a useful link for the discussions in subsequent chapters and makes the study more complete.

Chapter 5 considers the basic financial reporting and disclosure issues and gives the study group's recommendations. It recommends that credit unions: (1) use the accrual basis of accounting, (2) present comparative financial statements, (3) provide as much information regarding the maturities of assets and liabilities as possible, (4) disclose significant accounting policies, and (5) disclose any significant statutory requirements that have not been met. The presentation of a statement of changes in financial position was not considered necessary.

Chapters 6 to 14 discuss the nature and presentation of the individual balance sheet items such as members' accounts, cash and investments, other assets, liabilities and commitments, and retained earnings. These chapters cover a number of items that are unique to credit unions. For example, should shares owned by members of credit unions be classified as equities or as liabilities? Should dividends on shares be presented in the income statement or in the statement of retained earnings? The study group concluded that the investor shares in credit unions in provinces other than Quebec should be classified as liabilities rather than equities (p. 40). It also concluded that dividends on shares classified as liabilities be deducted in arriving at net income (p. 43) and that dividends on shares classified as equities be deducted in the statement of retained earnings (p. 43).

Chapter 15 covers the income statement items and concludes that most of the *CICA Handbook* recommendations be followed.

Chapter 16 relates to auditing issues such as the statutory audit requirements, audit reports, and audit committees. An interesting note is the substantial diversity among statutory requirements of the provinces. The study group concluded that the *CICA Handbook* recommendations be followed unless statutory requirements stipulate otherwise, and that audit committees should be useful for large credit unions.

Overall, this study is a welcome addition to the meager literature currently available in this area. It should be a useful reference for accounting practitioners, academicians, and students. Even though the study is concerned with Canadian credit unions, it should be applicable to similar situations in other countries.

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GAMING INDUSTRY SPECIAL COMMITTEE, *Audits of Casinos*, Audit and Accounting Guide (New York: American Institute of Certified Public Accountants, 1984, pp. vii, 77, $8.50 paper).

This Audit and Accounting Guide provides a substantial amount of descriptive background information on casinos, their games, organization, operations, and practices. It also considers accounting, reporting, and auditing issues. Thus, it would be useful not only to both the avocational and professional development and education of accountants, but also as a source of research ideas and anecdotal/illustrative material for classroom discussions of such issues as revenue and expense recognition in different situations.

H.S.H.

GLORIA L. GAYLORD and GLENDA E. RIED, *Careers in Accounting* (Homewood: Dow Jones-Irwin, 1984, pp. vii, 113, $9.95 paper).

This book contains an explanation of accounting career opportunities in public and corporate accounting, not-for-profit accounting, accounting education, and self-employment. It attempts to present such important factors as educational qualifications, position descriptions, salary ranges, certification requirements, and the potential and trends for each of the possible career paths described.

The latter part of the book is devoted to tips on getting started in an accounting job, including a discussion on resumé preparation, interviewing, and building a professional image. The last chapter provides information on what is needed to advance in a given career. It includes advice on communication strategies, stress management, and assertiveness.

One of the more valuable features of the book is the abundance of appendices that contain useful information. For example, Appendix 1-3 contains the various state requirements for CPA examinations, Appendix 3-1 contains addresses of the federal job information centers in each of the 50 states, Appendix A contains the names and national addresses of accounting-related organizations, and Appendix B contains a list of the major accounting journals of academic and professional societies.

One weakness is that the book attempts to do too much. It is a difficult task to provide a thorough explanation of all aspects of an accounting career in any one general area (such as corporate accounting), not to mention such an attempt for every possible career in the field. Much of the narrative, such as that on job descriptions, is sketchy, but the book could be used as a basic reference guide in the area.

The book would be very useful for a high school or college counselor who must advise students on career opportunities. It also would be worthwhile reading for a person considering majoring in accounting, or suitable as a reference book for an accounting instructor who devotes much of his/her time to undergraduate student counseling.

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MICHAEL GUILLEN, *Bridges to Infinity: The Human Side of Mathematics* (Los Angeles: Jeremy P. Tarcher, Inc., 1983, pp. ix, 204, $12.95 cloth, $6.95 paper).

This delightful little volume by a Cornell University mathematical physicist includes a chronology of mathematicians and their contributions, a glossary, a classified list of suggested readings, and an index.

It presents a series of interesting essays on various aspects of mathematics that can be understood and enjoyed by the layman. It deals with topics such as asymptotes, the differences between types of infinities, the fourth dimension, János Bolyai's discovery that Euclid's geometry was not universally true (as had been believed for over 2000 years) and his development of a non-Euclidian geometry, and Gödel's proof that there always will be mathematical truths that cannot be proved with logic (p. 117). The author establishes that much of mathematics, like art, is irrelevant except in the mind; thus, this is an excellent book for the nonmathematician—including many or most accountants—to begin learning about the mathematician's intellectual development.

H.S.H.

GABRIEL A. HAWAWINI, Editor, *Bond Duration and Immunization: Early Develop-*

ments and Recent Contributions (New York: Garland Publishing, Inc., 1982, pp. ix, 300, $42.00).

This book is a collection of research papers on bond duration and immunization that have appeared in the literature over the last 50 years. The editor has been careful to select only papers that provide a new direction and understanding.

The collection is presented in two parts. Part I deals with development and mathematics of bond duration and Part II is devoted to immunization strategies. This volume can be extremely valuable to students and scholars because it includes some works that often are cited but seldom are available in the libraries in the United States and elsewhere. Examples of these are passages from Frederick Macaulay's 1938 book on the definition and development of measures of bond duration and the F. M. Redington article on immunization that appeared in a British insurance journal in 1952.

Some may criticize the parsimonious nature of this collection since it includes only 13 research works, but this reviewer considers this to be more than offset, and a balance has been achieved by the bibliographical index and the list of articles that the editor provides (pp. 17–30). This book would be excellent for supplemental reading and should be a good library reference for advanced students of accounting and finance.

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Harold M. Keele and Joseph C. Kiger, Editors, *Foundations: The Greenwood Encyclopedia of American Institutions* (Westport, CT: Greenwood Press, 1984, pp. xvii, 516, $49.95).

This volume gives brief reports on some 230 of the largest and most prominent foundations in the U.S.—this includes those with assets of $30 million or more in 1980–1981. (Although less than one percent of the total number, these foundations are claimed to have about 65 percent of the assets and to disburse about 48 percent of the grants of all foundations [p. xxvii].) The editors carefully point out that they have excluded operating foundations —those that hire their own staff or directly fund a staff to carry out their projects; they are included in a companion volume (J. C. Kiger, *Research Institutions and Learned Societies*, 1982).

The brief reports included here also might be called historical sketches. They vary in interpretive and factual content since they were assembled from a variety of sources—the most informative and interesting, about one-third of the total, were written (with the author's name given) by a person associated with the respective foundation. The others were prepared by the editors from materials provided by the foundation and/or from publicly available sources—much of this from IRS report forms. Each report gives sketches of the foundation, its history, its benefactor(s), its programs and changes, its major emphasis and accomplishments, and its current address and administration.

In addition to a table of contents and the brief reports arranged alphabetically by foundation name/title, the volume has several appendices in which the foundations are classified by size (total assets), location (state), chronology (founding date), and genealogy (changes in name/titles). It also has an extensive index of the foundations, their founders, their beneficiaries, and other persons named in the reports.

This volume would be useful to grant-seeking accountants and accounting administrators, and should be included as a reference in their libraries.

H.S.H.

Ernest R. Larkins, *The Impact of Taxes on U.S. Citizens Working Abroad* (Ann Arbor: UMI Research Press, 1983, pp. xi, 129, $34.95).

The purpose of this research study was to determine whether changes in U.S. taxation of foreign-earned income have any effect on the presence of American employees in foreign countries. After validating business passport data as a suitable surrogate for the number of Americans working abroad, it analyzes such data by inferential statistics to ascertain the effect of relevant tax law changes in the 1976 Tax Reform Act and the 1978 Foreign Earned Income Act on the number of Americans employed abroad. The results indicated that the economically burdensome provisions of the 1976 Act had a negative impact while the more favorable provisions of the 1978 Act had a positive impact.

The author recognized that the conclusiveness of his findings is somewhat limited because the observed changes in Americans employed abroad could have been caused by extraneous factors rather than tax law changes. Nevertheless, the study's data base and methodology are an improvement over prior studies on the subject, and its findings should be given serious consideration by students, advisers, and legislators of tax policy. In light of the current status of the U.S. trade deficit and the favorable impact of American employees abroad on U.S. exports, this study is very timely.

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RICHARD M. RESTAK, *The Brain* (New York and Toronto: Bantam Books, Inc., 1984, pp. x, 373, $24.95, Can. $29.95).

This delightful, well-written book is based on the eight-part Public Television series of the same name. Dr. Restak used the interviews, transcripts, and background memos from the series and over 150 full-color and black-and-white illustrations to give "some feeling for the outer limits of our present knowledge about the brain, as well as what we can reasonably expect in the near and distant future" (pp. 1-2). He succeeds in presenting the information in a clear and comprehensible manner.

The author explores popular questions such as alcohol and brain cell death, brain-sex differences, brain specialization, Alzheimer's disease, the effects of drugs, and the work of leading modern researchers. Numerous examples of familiar events —both current and historical (or of artists and their works) are used effectively to increase reader understanding.

Since no prior knowledge of biology is needed, this book would be useful avocational and/or professional development reading for academic and practicing accountants. The information presented will enlighten, stimulate, and enrich the reader. Managers seeking to understand their personnel may achieve a new perspective for decision making.

H.S.H.

WILLIAM RULAND, *Manager's Guide to Corporate Tax* (New York: John Wiley & Sons, 1984, pp. xix, 370, $39.95).

This executive-turned-educator provides a nontechnical guide to the U.S. federal corporate tax for managers, lenders, and shareholders. This relatively short, general-interest reference source has two major objectives. First, the author provides a "basic understanding of the corporate tax and demonstrates how tax issues affect a corporate structure" (p. v). Second, he develops an appreciation of tax planning by conducting activities toward minimizing the present value of tax payments. Ruland meets these objectives quite well.

Directed towards managers in both large, publicly held corporations and closely-held corporations, the first six chapters provide general concepts in business taxation such as tax administration, opportunities for tax deferral, investment tax credit, property dispositions, recaptures, inventories, installment sales, pension plans, and employee stock options. In a noncomprehensive manner, the remaining six chapters cover tax issues unique to the corporate form of organization. One or more brief examples illustrate important and complex topics such as dividend payments, redemptions, liquidations, mergers, and divisions.

Although written for the executive with no tax or legal training, this excellent guidebook could be used in an MBA course. This author has done an admirable job with a complex subject matter.

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SANFORD J. SCHLESINGER, *Estate Planning for the Elderly Client* (New York: John Wiley & Sons, 1984, pp. xxvii, 482, $70.00).

The title suggests a more specialized treatment of the subject than actually is the case. The strength of the book lies in its addition of topics (e.g., Medicare, Medicaide, hospice, and income tax benefits for the aged) to an otherwise traditional introduction to estate planning aimed at one without extensive prior experience. The additions do not restrict the book to the elderly but expand its scope to include them.

The intended readership seems to be practicing attorneys. Though the preface implies the book will be useful to others, and indeed this is the case, it remains a legal treatise prepared by a lawyer. It contains sample forms (e.g., antenuptial agreements and Crummey trust clauses) and tables of statutes, regulations, revenue rulings, and judicial decisions that afford the more than casual reader an opportunity to pursue each point.

A further advantage is its unusually high degree of clarity and its avoidance of redundancies. Selected portions could well be read by the client. An abundance of multiple-issue examples adds to the book's comprehensibility. Above all, it purports to be current through the July 1984 Deficit Reduction Act and boasts an intent to remain so (a slit in the back cover will accommodate a forthcoming "pocket part").

The book is partly flawed by some perhaps inadvertent humor and even condescension. For example, it is suggested that a letter of instructions and guidance from decedent to survivor should be written by the former "prior to death" (p. x), and in speaking to an older client with hearing loss one should "enunciate clearly" (p. xiii).

A curious feature is the discussion of the laws of intestacy in California, Florida, New Jersey, New York, and Texas. For those who practice there, the discussion is quite brief; for those who practice elsewhere, this information is readily available in a commonly used legal directory.

The book contains an excellent exposition of possible dangers of full use of the marital deduction and underutilization of the unified credit at the death of the first spouse (this leads to credit shelter bequests for which the book furnishes more forms). It offers impressive sections on transfers to minors, retirement plans, and the impact of state taxation. There are two strong chapters on the Living Will and the Disabled, Incapacitated, and Handicapped (including nursing homes and durable powers of attorney).

Though aimed at the lawyer, this extremely well-written book should be of interest to the CPA, especially because of the supplementary matter pertaining to the elderly. Because it is more an introductory than an advanced-level treatise, it scarcely can serve as a professional planner's only resource. For academic use, it would be a highly appropriate addition to an accounting reference library and quite useful as a source for supplementary reading in an accounting course in estate and gift taxation.

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IRVING S. SHAPIRO with CARL B. KAUFMANN, *America's Third Revolution: Public Interest and the Private Role* (New York: Harper & Row, Publishers, 1984, pp. xiii, 283, $17.95).

In this book Mr. Shapiro explores what he calls the Third Revolution in America ("The first was for political freedom. The second . . . was technological and material in focus. . . . The third . . .is . . . to make real the notions of social justice and equality" [p. 1]). He states that the "third revolution began about a half-century ago and has since become the central fact of domestic life in the United States" (p. 1). Thus, Shapiro, the son of Lithuanian immigrants who received his baccalaureate in 1939 and his law degree in 1941 (both from the University of Minnesota) and rose through the ranks to become chairman/CEO of Du Pont, has lived all of his professional life in the third revolution.

Reflected in the book is his reputation for being a socially responsible businessman. This is at the core of the three themes that pervade the book: (1) that institutions are means, not ends, (2) that the private sector should contribute more than it has to the public-policy process, and (3) that leaders in the private sector have a quasi-public status and must accept the related public responsibilities (p. ix). He also expresses a belief common to many, and ideally to all, that each person ought not take more out of the system than he/she tries to put back—many would state this more positively by stressing the putting back.

This book by a remarkable, successful business leader who now is in another career as lawyer/consultant/corporate director should be useful, interesting avocational/professional development reading for both academic and practicing accountants—even the cynical as well as the supporters of Nobel laureate Milton Friedman's argument against altruism by businessmen.

H.S.H.

THOMAS SOWELL, *The Economics and Politics of Race: An International Perspective* (New York: William Morrow and Co., Inc., 1983, pp. vi, 324, $15.95).

This is the most recent of many books by an economist (Ph.D., Chicago) and Senior Fellow at the Hoover Institute who has been a center of controversy for arguing that differences among racial and ethnic groups are substantial and important, that these differences will not soon disappear, and that our society will continue getting into trouble if rhetoric and public policies continue to assume that discrimination is what causes any group to do less well than others.

The author developed his argument in a previous book (*Ethnic America*, Basic Books, Inc., 1981) with extensive data on the records of the principal ethnic groups in the U.S. In this book he takes the argument a step farther and attempts to overcome an objection to his earlier findings by gathering data on these groups' experiences in other countries to determine how they compare to their U.S. record.

The groups studied included blacks, Chinese, Germans, Hispanics, Japanese, and Jews. His findings indicate that a group's record in different countries is remarkably similar. From this, he suggests that groups are likely to have problems in the U.S. if their traditions do not drive them to acquiring and developing human capital (in which he includes not only education and training but also skills, discipline, foresight, frugality, good health, and organization talents), and that society can do little to help groups that lack this drive since what they need is to increase their absorption of middle-class values and their emphasis on work and frugality, and since most programs designed to help underprivileged groups have been counterproductive.

This book is based on substantial research into secondary sources, is carefully documented (1566 endnotes on 55 pages), and is written in a style that is interesting both despite and because of the extensive detail. It would be useful avocational reading for both academic and practicing accountants, especially those who are interested in public policy issues.

H.S.H.

BARRY SPITZ, *International Tax Planning*, Second Edition (London and Scarborough, Ont.: Butterworths & Co., 1983, pp. xxiii, 178, £17.50, Can. $45.00).

With the increasing involvement of small and intermediate-size businesses in international transactions, the need for guidance in analyzing and planning for international tax factors has become widespread. In this book, the author provides an excellent overview of the approach that should be taken in such planning.

The work does not focus on any particular foreign jurisdiction or tax system. Instead it emphasizes the development of the data base of the tax and related non-tax factors that should be evaluated and provides insight into their varying meaning and significance by numerous examples from many foreign jurisdictions. Then it describes and illustrates the various stages and elements involved in designing an international tax plan, analyzing the data base, and evaluating, debugging, and updating the plan.

The work is not designed as a reference book or manual of tax planning solutions. But practicing lawyers, accountants, and business executives with little or no experience in this area definitely will find it helpful in coping with problems requiring some measure of international tax planning. Even experienced practitioners may gain new insight from its lucid explanation of relevant technical terms and concepts. It also would provide good background or supplemental reading in a university course in international tax and/or business planning.

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ROBERT J. THIERAUF, *A Manager's Complete Guide to Effective Information Systems: A Questionnaire Approach* (New York: The Free Press, 1983, pp. ix, 294, $23.95).

This book presents two questionnaires for information systems controls evaluation, one for general controls and one for application controls; this breakdown should be familiar to most accountants since it is based on AICPA publications. Both questionnaires are good and would be useful in practical situations even though some questions are inappropriate for such a questionnaire since they do not have "yes" or "no" answers. (For example: Are the computer department's long-range plans adequate for meeting the organization's objectives? [p. 38].) But both questionnaires are reprinted from another book, so this book is not new in that sense.

The author conducted a non-scientific survey with no statistical controls or tests and computations of only the most straightforward descriptive statistics. Unfortunately, this has led the author to describe the work in the Preface as a "landmark publication," which it is not, and the steps of his survey as "research methodology," which they are not. Further, while the entire work discusses controls on information systems, the title is misleading: it says this is a "complete guide," which it is not, and that it is about "effective information systems," which get limited coverage. Thus, this book can not be recommended.

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KIRKLAND A. WILCOX and JOSEPH G. SAN MIGUEL, *Introduction to Financial Accounting*, Second Edition (New York: Harper and Row, Publishers, 1984, pp. xxiv, 871, $29.50).

This second edition incorporates three significant changes from the first edition (reviewed October 1980, pp. 704–705):

1) The sequence of topics follows what the authors call the transaction approach rather than the conventional tour of the balance sheet.
2) Fifty-five demonstration problems with solutions are interspersed throughout the text, immediately following the related material.
3) The chapter on business combinations has been omitted.

As before, the emphasis is slightly on the side of accounting concepts, accounting policy, and the communication of accounting information. But this reviewer considers the coverage of mechanics and procedures from the viewpoint of a preparer to be more than sufficient. For those who wish even more coverage of mechanics, the last chapter covers special journals, subsidiary ledgers, and payroll accounting and can be included earlier in the course.

The main problem with the traditional sequence, according to the authors, is that students have difficulty relating to abstract concepts like current assets, current liabilities, stockholders' equity, and the other balance sheet categories. They believe that students can more easily relate to common business transactions and can understand how the transactions flow into the balance sheet items. Accordingly, after a traditional four-chapter section dealing with the balance sheet, the income statement, and the accounting cycle, the book contains a section on accounting for operating transactions. Operating transactions include cash and credit sales, purchases of merchandise, cost of goods sold, acquisition and use of tangible fixed assets, and accrued expenses. Although cash is deferred to the chapter on the statement of changes in financial position (SCFP), the other assets and liabilities related to these operating transactions (e.g., accounts receivable and inventory) are covered in conjunction with the discussion of the transactions. The chapter on inventory is particularly well-written, especially the explanation of LIFO. Up to this point, Chapter 9, the transaction approach works pretty well.

Unfortunately, virtually all the transactions to which students can easily relate have been covered. Instead of returning to the traditional balance sheet sequence, the authors persist with their perception of the transaction approach, resulting in constant switching from one balance sheet category to another. This reviewer's experience is that even frequent references by the instructor to the two sets of financial statements included at the end of the book cannot prevent students from becoming disoriented. On the positive side, the chapters and assignment materials are divided into parts, making rearrangement of the topics relatively easy.

The authors claim to provide complete coverage of the topics typically found in a first financial accounting course. Included are well-written chapters on the SCFP (cash and working capital), the techniques for dealing with changing prices (constant dollar and current cost), and the evaluation of a business enterprise (including the meaning of the various types of audit reports). But coverage of several important topics typically included is either perfunctory or nonexistent. These include:

1) Intraperiod income tax allocation and the sections of the income statement that follow income from continuing operations—discontinued operations, extraordinary items, change in accounting principle, and earnings per share;
2) Compilation and review reports by external accountants;
3) Early extinguishment of debt and troubled debt restructuring;
4) Accounting for leases and pensions; and
5) Business combinations (the chapter omitted from this edition).

Of these, the neglect of the lower portion of the income statement is clearly the most serious.

The 55 demonstration problems added for this edition are very effective. The solutions are comprehensive and well-written. Having students study these problems can reduce the amount of class time devoted to mechanical procedures.

The assignment material also is very good. The "Short Problems for Quick Review" are especially useful in illustrating major points with a minimum of pencil pushing.

The text is accompanied by the usual supplementary materials. The instructor's manual is particularly well done and includes chapter outlines, brief descriptions of the homework problems, and tables relating the problems to topics.

In summary, this book is well written, leans toward the conceptual, contains excellent assignment material, and is suitable for a first course in financial accounting at the undergraduate level.

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ROBERT WILLENS, *Taxation of Corporate Capital Transactions: A Guide for Corporate, Investment Banking, and Tax Advisers* (New York: John Wiley & Sons, 1984, pp. xviii, 519, $65.00).

This recent book by a partner with Peat, Marwick, Mitchell & Co. provides a comprehensive guide for corporate and investment banking and tax advisers. Part 1 covers dividends, redemptions, partial liquidations, and Section 306 stock. Part 2 discusses liquidations at both the shareholder and corporate level, including collapsible corporations. The primary focus of this reference volume, Part 3, includes organization of a corporation and reorganizations. This last part has an excellent coverage of Section 367 and net operating losses. Changes made by the Tax Reform Act of 1984 are not included, but the volume is to be updated when needed.

Extensively footnoted, this volume is an excellent addition to the Wiley Tax and Business Guides series. Willens presents the vast array of rules and regulations with many real-life examples such as the U.S. Steel-Marathon Oil acquisition and the Mobil-Esmark redemption. Letter rulings are liberally used as a guide to the IRS position on issues. The filings with the SEC, dealing with consummated transactions, provide the reader with a perspective on corporate issues that a person will face in day-to-day business.

This book could be used in a corporate tax course if the instructor provided some problem materials. The one small shortcoming is the lack of short, mathematical examples. Hopefully Wiley's future books in this series will contain some short examples. This book is worthy of being on the bookshelf of its intended audience: tax practitioners, students, and corporate employees.

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THE ACCOUNTING REVIEW
Vol. LX, No. 4
October 1985

SOFTWARE SUMMARIES

Harvey S. Hendrickson, Editor

TERESA ALBERTE-HALLAM, STEPHEN F. HALLAM, and JAMES A. HALLAM, *Microcomputer Use: Word Processors, Spreadsheets, and Data Bases* (Orlando: Academic Press, Inc., 1985, pp. xi, 421, $27.00).

This is a well designed, integrated package available for MS-DOS 2.0, Apple and CP/M. The software accompanies the manual, hence, the instructor is not hampered by licensing restrictions.

The operations and functions are similar to those found with WordStar, SuperCalc, and dBase. Each of the application programs is limited: word processing permits seven to ten pages, the spreadsheet is 32 by 64, and the data base will take up to 16 files. The time required to learn to use each of these programs is modest, approximately six hours each; each program can be learned independently.

The student manual is well written and easy to follow, taking a hands-on approach. The instructor's manual contains outlines, notes, answers to exercises, and quiz material.

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IBM PC Apprentice Series, various titles (Englewood Cliffs: Prentice-Hall, Inc., 1984, $14.95 tutorial workbook, $19.95 teacher pack, $29.95 student self-teach version).

A major problem confronting institutions that have acquired personal computers is the acquisition of usable, affordable software that is free of licensing restrictions. Templates, a popular offering from educational publishers, are not a solution to the problem since they presume access to commercial software that can be very expensive and difficult to control. Commercial software also requires varying degrees of learning time that can cause difficulty if the requirement is to learn to use the software while simultaneously applying it to the material of the course, the content of which also is new.

The IBM PCA Series was designed to address these problems. There are approximately 30 titles to date, many of which are recognizable even to those who do not use computers (e.g., dBase II, SuperCalc, Framework, Wordstar, Multimate, and Profit Center). The students purchase a manual which comes with a license allowing them to receive a copy of the educational version of the software. This is a limited but usable version of the commercial software package. By way of caution, it is appropriate to check the limitations or dimensions of the educational version before making specific assignments to be certain that the work assigned does not exceed the limits of the program; for most textbook applications, this should not constitute a problem.

The teacher pack contains the tutorial workbook, suggestions for course preparation and lesson plans, and the master disk from which students make their copies.

In the opinion of the reviewer, the educational versions of the software in this series can be self-taught while the student is taking an accounting course. Students should be able to apply the selected software program to the course content well before the course is over. A major advantage of the software in this series is that students can continue to use it throughout their studies, whether the course is in accounting or not.

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Books Received January 21, 1985 to April 20, 1985

James Ring Adams, *Secrets of the Tax Revolt* (San Diego: Harcourt Brace Jovanovich, Publishers, 1984, pp. xiii, 402, $16.95).

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Harold E. Arnett and Neill R. Schmeichel, *Increasing Productivity in the United States: A Political, Social, and Economic Policy Approach* (Montvale, NJ: National Association of Accountants, 1984, pp. xv, 251, $19.95 paper).

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Subscription Rate $55 U.S. & Canada, $65 overseas. Address subscription correspondence to PDI, P.O. Box 13288 NTSU, Denton, TX 76203, editorial correspondence to Horace R. Brock, Extractive Industries Accounting Research Institute, P.O. Box 13677 NTSU, Denton, TX 76203.

Journal of Business Finance & Accounting

Editor: Richard Briston

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Published Quarterly by the
AMERICAN ACCOUNTING ASSOCIATION

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Gary C. Biddle
Stanley F. Biggs
Jacob G. Birnberg
Edward J. Blocher
James R. Boatsman
Germain Boer
A. Faye Borthick
Michael Bourn
Robert M. Bowen
Richard P. Brief
Lawrence D. Brown
Bruce Bublitz
Stephen L. Buzby
Joseph Bylinski
Robert J. Capettini
Richard P. Castanias
Joyce T. Chen
G. Richard Chesley
John Christensen
Andrew A. Christie
William O. Cleverly
G. Adolf Coenenberg
Edward N. Coffman
Julie H. Collins
William A. Collins
Eugene E. Comiskey
David J. Cooper
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Michael A. Crosby
Barry E. Cushing
Larry Dann
Sidney Davidson
Edward B. Deakin, III
Douglas V. DeJong
Joel S. Demski
Dan S. Dhaliwal
J. Richard Dietrich
David A. Dittman
Allan R. Drebin
Lowell Dworin
Thomas R. Dyckman
Carol E. Eger
Ian R. C. Eggleton
John Eichenseher
Pieter T. Elgers
R. K. Elliott
Robert K. Eskew
John H. Evans, III
William L. Felix, Jr.
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George J. Foster
Jere R. Francis
Werner G. Frank
Katherine B. Frazier
Thomas Frecka
Robert J. Freeman
James M. Fremgen
H. Dov Fried
Laurence A. Friedman
Paul Frishkoff
Helen Gernon
Dan Givoly
Frøystein Gjesdal
James T. Godfrey
Lawrence A. Gordon
Vijay Govindarajan
Penelope Sue Greenberg
Paul A. Griffin
Richard A. Grimlund
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Susan Haka
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W. Thomas Harrison
Loyd C. Heath
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Yuji Ijiri
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Fredric H. Jacobs
Prem Jain
Daniel L. Jensen
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Thomas E. Kida
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W. Morley Lemon
Baruch Lev
Gerald J. Lobo
Diane Lockwood
James Loebbecke
Larry L. Lookabill
Steven Lustgarten
Tom Lys
James G. Manegold
D. Marcinko
Ella Mae Matsumura
Gordon S. May
John H. McCray

Kathleen T. McGahran
Edward V. McIntyre
Thomas E. McKee
James C. McKeown
Yaw M. Mensah
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Valerie C. Milliron
Roland Minch
Theodore J. Mock
Rosanne M. Mohr
Michael L. Moore
Shane R. Moriarity
Michael H. Morris
Gerhard G. Mueller
R. D. Nair
Alfred J. Nanni, Jr.
Marilyn Neimark
Bruce R. Neumann
Paul Newbold
D. Paul Newmann
Loren A. Nikolai
Marcia Niles
Christopher W. Nobes
Susan L. Nordhauser
Hugo Nurnberg
Pekin Ogan
James A. Ohlson
Terry O'Keefe
Chris Olsen
Edmund Outslay
Krishna Palepu
Dan Palmon
Zoe-Vonna Palmrose
Soong H. Park
James M. Patell
James M. Patton
Dennis H. Patz
Stephen H. Penman
Enrico Petri
Glenn M. Pfeiffer
Jamie Pratt
Gary John Previts
Lee H. Radebaugh
Graeme Rankine
Phillip M. J. Reckers
Lawrence Revsine
Steven J. Rice
William E. Ricks
Larry E. Rittenberg
Byung-Tak Ro
Donald M. Roberts
John C. Robison
Howard O. Rockness
Harold P. Roth
William J. Ruland
E. Kent Saint Pierre
J. Timothy Sale
Robert Scapens
Lawrence D. Schall
Albert A. Schepanski
Katherine Schipper
Joseph J. Schultz, Jr.
George M. Scott
William R. Scott
Frank H. Selto
Michael D. Shields
Randolph A. Shockley
Daniel G. Short
Dan A. Simunic
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Charles H. Smith
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Douglas A. Snowball
Ira Solomon
James E. Sorensen
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Rajendra P. Srivastava
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Shyam Sunder
Edward P. Swanson
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Arthur L. Thomas
Peter Tiessen
Anthony M. Tinker
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Wilfred C. Uecker
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Robert E. Verrecchia
Don W. Vickrey
Robert L. Vigeland
Wanda A. Wallace
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John H. Waterhouse
Gregory Waymire
Ron Weber
Karl Weick
Roman L. Weil
G. P. Whittred
John J. Wild
Mark A. Wolfson
F. Ken Wright
Arthur R. Wyatt
Mark Young
Richard Young
Christine V. Zavgren
Ian Zimmer
Mark E. Zmijewski

OCTOBER 1985 PLACEMENT ADS

The deadline for information to be included in the "Placement Information" section is two months prior to the date of publication. The REVIEW *is published on the first day of January, April, July, and October. Placement advertising and replies should be sent to the American Accounting Association, 5717 Bessie Drive, Sarasota, FL 33583. All replies to box numbers should be on separate sheets to facilitate forwarding. There is no charge for this service to AAA members and associate members seeking employment. Others will be charged a fee of $100 per insertion. Ads should not exceed 100 words.*

#401 KENT STATE UNIVERSITY. Tenure-track positions in accounting for Fall 1986. Doctorate in accounting (or ABD advanced stages) required. CPA and/or CMA desired. Rank and salary depend on qualifications. Specialties in all areas of accounting considered; special needs are in cost/managerial accounting, accounting systems, and tax. Send resumés and inquiries to Dr. David F. Fetyko, Chairman, Department of Accounting, 434 BSA, Kent State University, Kent, OH 44242. Application deadline is November 16, 1985 or until positions are filled. Kent State is an AA/EO employer.

#402 CHAIR IN TAXATION AT TEXAS TECH UNIVERSITY—Nominations are being accepted for the Frank M. Burke Chair in Taxation, which is endowed at a level of $600,000. The candidate should possess impressive credentials in all areas of scholarly endeavor, interface successfully with the accounting community, provide leadership in academic and research programs in taxation, and currently hold the rank of associate or full professor. Address inquiries to Professor Gary White, College of Business Administration, Texas Tech University, Box 4320, Lubbock, Texas 79409. Texas Tech University is an affirmative action, equal opportunity employer.

#403 TEXAS TECH UNIVERSITY invites applications for permanent faculty positions in Accounting beginning Fall 1985. Positions are expected to be available at all levels for teaching and research interest in financial accounting systems, tax, and auditing. Doctorate required. Certification desirable. Competitive salaries commensurate with experience and education. Texas Tech offers accounting programs at the undergraduate, masters, and doctoral levels. A graduate specialty is available in tax. Apply to Professor Gary E. White, College of Business Administration, Texas Tech University, P.O. Box 4320, Lubbock, Texas 79409. An Affirmative Action/Equal Opportunity Employer.

#404 THE UNIVERSITY OF DELAWARE, Department of Accounting, is recruiting faculty for September 1986. Emphasis in managerial and financial accounting preferred, but other qualified faculty with interests in other accounting areas will also be considered. A Ph.D. or DBA in Accounting is required. The nine-hour normal load generally consists of three sections with two preparations. The teaching assignments are selected according to the individuals' interests and qualifications. The Department offers an M.S. in Accounting (fifth year), in addition to a strong undergraduate accounting program. Teaching and course development will be expected at both the graduate and undergraduate levels. Undergraduate program accredited by AACSB. The University of Delaware is located in a suburban/rural setting about midway between New York City and Washington, D.C. The University of Delaware is an Equal Opportunity Employer which encourages applications from qualified minority groups and women. Please contact Chairperson, Department of Accounting, University of Delaware, Newark, DE 19716 (Phone 302-451-2961).

#405 ASSISTANT/ASSOCIATE PROFESSORS (two tenure-track positions). Candidates should have a strong commitment toward quality and research and teaching. URI is accredited by the AACSB. Salaries are competitive and commensurate with experience. Ph.D. (or ABD near completion) in Accounting required. Record of publications and excellent teaching required for associate position. CPA and/or CMA desired/preferred. Applicants should contact by November 15, 1985: Henry Schwarzbach, Chair, Department of Accounting, College of Business Administration, The University of Rhode Island, Kingston, RI 02881-0820. An AA/EOE m/f.

#406 THE UNIVERSITY OF RHODE ISLAND. Assistant Professor level vacancy. Tenure-track position. Candidates should have a strong commitment toward quality research and teaching. URI is accredited by the AACSB. Salaries are competitive and commensurate with experience. Ph.D./DBA with accounting concentration or ABD with dissertation near completion. CPA/CMA preferred. Teaching and research experience in Auditing preferred. Applicants should contact by November 15, 1985, Henry Schwarzbach, Chair, Department of Accounting, College of Business Administration, The University of Rhode Island, Kingston, RI 02881-0820. An affirmative action/equal opportunity employer m/f.

#407 VISITING PROFESSOR or full-time person to fill a *new* tenure-track opening. Start Fall 1985 or Winter 1986. Candidates should have appropriate doctorate (ABD will be considered). Teaching responsibilities include undergraduate and MBA accounting courses. Salary and rank open, commensurate with qualifications and experience. Georgia College, with 3,600 students, is 30 miles northeast of Macon and 95 miles southeast of Atlanta. The College is an equal opportunity, affirmative action employer. Send resumé to Dr. Eugene Shepard, Chairman, Department of Accounting, Georgia College, School of Business, Milledgeville, Georgia 31061.

#408 THE UNIVERSITY OF MICHIGAN—FLINT, School of Management invites applications for a permanent tenure-track faculty position in ACCOUNTING. Rank is dependent upon qualifications. Salary and benefits very competitive. Teaching in both BBA and MBA programs. Ph.D./DBA with CPA/CMA preferred. ABD required. To teach management accounting/financial accounting/management information systems. Position available September 1986 or January 1987. UM-Flint is a non-discriminatory, affirmative action employer. Send resumé to Dean Richard W. Fortner, School of Management, The University of Michigan-Flint, Flint, Michigan 48503 or call (313) 762-3164.

#409 THE DEPARTMENT OF ACCOUNTING OF THE UNIVERSITY OF WYOMING is seeking qualified applicants for tenure-track positions at the rank of Assistant, Associate or full Professor for the fall of 1986. Qualifications for the rank of Assistant Professor include completion of a Ph.D. or D.B.A. degree and a strong commitment to high-quality teaching and research. Candidates for a senior position must have an established record in both areas. All resumés should be sent to: Keith H. Burdick, Chairman, Department of Accounting, College of Commerce & Industry, The University of Wyoming, Laramie, Wyoming 82071. The University of Wyoming is an Equal Opportunity, Affirmative Action Employer.

#410 UNIVERSITY OF SOUTHERN CALIFORNIA, School of Accounting, is seeking candidates for faculty positions leading to tenure with a primary interest in taxation, managerial accounting, and financial accounting. Faculty positions above the assistant rank are possible for individuals with a strong teaching and publication record. Candidates for assistant professor should have a doctorate in hand or be near completion of the dissertation, strong teaching ability and interest in research. The University of Southern California is an equal opportunity, affirmative action employer. Applications are encouraged from women and minority persons. Please contact Professor Doyle Z. Williams, Dean, School of Accounting, University of Southern California, Los Angeles, California 90089-1421.

#411 THE UNIVERSITY OF ARKANSAS AT LITTLE ROCK invites applications for the tenure-track position of Professor or Associate Professor of Accounting. Candidates should have the Ph.D. or DBA degree in Accounting, and a certification (CPA, CMA or CIA) is desirable. Dedication to excellence in teaching, research and professional activities, as well as a level of scholarly achievement to support consideration of the Professor or Associate Professor rank, is necessary. Salary is negotiable and competitive. UALR has AACSB accreditation at both the undergraduate and graduate level. Send resumé to Dr. Robert C. Culpepper, Chairman, Department of Accounting, UALR, Little Rock, AR 72204. An equal opportunity, affirmative action employer.

#412 TEMPLE UNIVERSITY seeks applicants for accounting faculty positions. Rank is dependent on candidate's qualifications. Salaries are competitive, fringe benefits are excellent. Candidates should hold a doctorate in accounting or ABD with substantial progress toward completion. CPA or CMA is a plus. The Department desires well-balanced performance by its faculty, including teaching excellence, publications and service. BBA, MBA, MS in Tax, and Ph.D. programs are offered. Temple University is located in historic Philadelphia and is a short drive from the Pocono Mountains and the Jersey shore. Apply to: Dr. Stephen L. Fogg, Chairman, Department of Accounting, School of Business Administration, Temple University, Philadelphia, PA 19122. Telephone (215) 787-1915. Temple University is an equal opportunity, affirmative action employer. Qualified minorities and women are encouraged to apply.

#413 POSITIONS AVAILABLE AT THE UNIVERSITY OF NORTH DAKOTA at the associate or full professor level for January or August 1986. Should have the doctorate and also an interest in research and publication. Salary competitive. Send resumé to: Professor Ludwik Kulas, Chairman, Department of Accounting and Business Law, College of Business and Public Administration, University of North Dakota, Grand Forks, ND 58202. An Equal Opportunity/Affirmative Action Employer.

#414 CLARK UNIVERSITY, Graduate School of Management, invites applications for tenure-track faculty position in ACCOUNTING, starting September 1986. Ph.D./DBA preferred; ABD or MBA/CPA considered. Rank, salary and benefits: competitive and dependent upon qualifications. Teaching load: five sections per year. Publication and professional activities are expected. Clark is a small, quality, private university in Worcester, New England's second largest city (42 miles west of Boston). Application deadline: February 15, 1986. Contact Dr. Richard J. Bartkowski, Assistant Professor of Accounting, Graduate School of Management, Clark University, 950 Main Street, Worcester, MA 01610. Clark University is an Equal Opportunity, Affirmative Action Employer.

#415 GEORGE WASHINGTON UNIVERSITY, Department of Accountancy. Tenure-track faculty positions open in Accounting. Candidates are expected to possess a doctoral degree or be near completion of degree and should be dedicated to teaching excellence and research. GWU is an equal opportunity, affirmative action employer. Please send vita to Professor Michael Gallagher, Chairman, Department of Accountancy, George Washington University, 710 21st Street, N.W., Room 209, Washington, DC 20052. Telephone: (202) 676-6825.

#416 DUKE UNIVERSITY—The Fuqua School of Business is seeking highly qualified faculty members in accounting. The qualifications required for these positions are a demonstrated interest in and capacity to do publishable research and a high level of competence in classes for MBAs and Ph.D.s. A Ph.D. degree is required. Rank and salary depend upon qualifications. Send resumé and list of references to Professor David A. Dittman, Fuqua School of Business, Duke University, Durham, NC 27706. Duke University is an Affirmative Action, Equal Opportunity Employer.

#417 UNIVERSITY OF BALITMORE invites applications for tenure-track positions in accounting. Teaching excellence is stressed; research experience and professional activities required. Applicant must possess the doctorate or equivalent (Ph.D., DBA, LLM/CPA). The University of Baltimore is an upper division, AACSB-accredited institution at the Junior, Senior, and Master levels (Masters of Taxation and Masters of Accounting). Forward your resumé to Dr. Charles L. Martin, Jr., CPA, Accounting Department, University of Baltimore, 1401 North Charles Street, Baltimore, Maryland 21201. The University of Baltimore is an Equal Opportunity, Affirmative Action Employer.

#418 ACCOUNTING: Troy State University seeks applications for a tenure-track position for accounting faculty. Appropriate terminal degree desired. A.B.D.'s will be considered. Rank and salary depend on qualifications. Responsibilities include undergraduate teaching. Contact: Robert Palmer, Chairman, Department of Accounting, Finance and Business Law, Sorrell College of Business, Troy State University, Troy, Alabama 36082. TSU is an AA/EO employer.

#419 STANFORD UNIVERSITY Graduate School of Business invites applications for position as Assistant Professor of Accounting, effective September 1986. Candidate must have or be completing Ph.D., and must possess skills in and have an aptitude for scholarly research and graduate level (M.B.A. and Ph.D.) teaching. Stanford University is an Equal Opportunity Employer and welcomes applications from qualified minorities and women. Applications should be received by December 15, 1985, and should include resumé, thesis proposal or abstract, transcript of grades from universities attended, names and addresses of three references, and copies of any research papers and publications. Applications must be forwarded in entirety to Associate Dean for Academic Affairs, Graduate School of Business, Stanford University, Stanford, California 94305.

#420 FACULTY POSITION—CASE WESTERN RESERVE UNIVERSITY is seeking faculty members in accountancy. Qualifications required include a demonstrated capacity to undertake publishable research, teaching competence for undergraduate and graduate professional accountancy courses. Skills in several specialization areas such as Auditing, Taxation, Managerial and Financial Accounting are preferred. A doctorate or the equivalent terminal qualification and experience is required. Rank and salary depend upon qualifications. Send resumé and references to Gary John Previts, Weatherhead School of Management, Case Western Reserve University, Sears Library Building Room 607, Cleveland, Ohio 44106. Case Western Reserve University is an Affirmative Action/Equal Opportunity Employer.

#421 COLUMBIA UNIVERSITY GRADUATE SCHOOL OF BUSINESS is seeking candidates for appointment to accounting faculty at assistant professor or higher. Strong research environment with easy interaction with finance, management science, organizational behavior, and economics faculties. Salary and benefits competitive. One-year visitation possible for a senior candidate considering permanent appointment. Candidates must have a Ph.D. or D.B.A. (or, for entry-level rank, be close to completion of doctoral dissertation) and must have strong research credentials. Teaching primarily in financial accounting with some opportunity to teach auditing or information systems. Please send resumé to Gordon Shillinglaw, 621 Uris Hall, Graduate School of Business, Columbia University, New York, NY 10027. The Columbia University Graduate School of Business is an Equal Opportunity/Affirmative Action Employer.

#422 LOUISIANA STATE UNIVERSITY, Department of Accounting anticipates faculty openings for the Fall of 1986. While these openings are primarily at the assistant professor rank, applications at other ranks will also be considered. Candidates should have a doctorate or be near completion of their doctoral program. Faculty are expected to teach 6 to 9 hours per semester and be actively involved in research and professional service. The University is an Equal Opportunity/Affirmative Action Employer. Please send resumés and references to: Dr. Vincent C. Brenner, Chairman: Department of Accounting, College of Business Administration; Louisiana State University; Baton Rouge, LA 70803.

#423 OREGON STATE UNIVERSITY has two openings for faculty positions as Assistant Professor in Accounting which will become available during the 1986–87 academic year. Responsibilities of the persons holding these positions include teaching, research, and professional activities in the field of Accounting. The teaching assignment will include instruction of accounting courses, mostly at the undergraduate level. Research activities are expected to result in the advancement of knowledge of accounting and related subjects. Professional activities include working with professional accounting associations and other groups whose interest is accounting. Candidates should hold the appropriate doctorate or have substantially completed the degree requirements. Qualified candidates should send letters of application and resumés to: Charles Neyhart, Chairman, Department of Accounting, College of Business, Oregon State University, Corvallis, OR 97331. Oregon State University is an Equal Opportunity/Affirmative Action Employer.

#424 TWO FULL-TIME ASSOCIATE OR FULL PROFESSORSHIPS IN ACCOUNTING. Most interest areas can be accommodated though candidates in managerial, taxation or systems preferred. Quality research and strong publication record expected. Candidates should possess Ph.D./DBA or LLM (Taxation). CPA, CMA, or CIA certification highly desirable. Compensation is competitive. SMSU enrolls over 3500 students in undergraduate and graduate business program. Pleasant suburban location with ready access to outstanding outdoor recreational areas. Review of applicants begins January 1, 1986, open until filled. Forward vita to Richard L. Nichols, Accounting Department, Southwest Missouri State University, Springfield, MO 65804.

#425 THE UNIVERSITY OF IOWA is seeking applicants to fill permanent or visiting Assistant, Associate and/or Full Professor positions beginning fall 1986. Principal qualifications are: (1) terminal degree (Ph.D. or DBA) (Assistant Professor may be A.B.D.); (2) genuine interest in accounting research and in working closely with undergraduate and graduate students; (3) Senior Professors must have established record of quality teaching and research with demonstrated competence in directing doctoral theses; (4) all candidates must have long-term interest in teaching. Screening will begin upon receipt of a resumé sent to: Russell J. Petersen, Department of Accounting, College of Business Administration, University of Iowa, Iowa City, Iowa 52242. This announcement will remain open until all positions are filled. The University of Iowa is an equal opportunity and affirmative action employer.

#426 THE UNIVERSITY OF IOWA is seeking applicants to fill position as Head of Department and Professor of Accounting beginning fall 1986. Principal desirable qualifications are: (1) terminal degree (Ph.D. or DBA); (2) record of competence and leadership in academic administration at College or Department level including supervision of external affairs, placement, research and teaching program administration or equivalent experience; (3) must have established record of quality teaching/research; (4) candidates must have long-term interest in teaching. Screening will begin upon receipt of resumé to: Daniel Collins, Chair, Head Search Committee, Department of Accounting, The University of Iowa, Iowa City, Iowa 52242. This announcement will remain open until all positions are filled. The University of Iowa is an equal opportunity and affirmative action employer.

#427 UNIVERSITY OF CALIFORNIA, DAVIS—*Faculty position in Accounting. One position with rank open in Accounting in the Graduate School of Administration.* Duties include graduate instruction, course development, and a high level of research productivity. Applicants should have research experience or demonstrated potential in at least one of the following areas: managerial accounting, planning and control systems, or accounting information systems. Ph.D. or equivalent is required. Send vita and names and addresses of four references to Gary M. Walton, Dean, Graduate School of Administration, A-2, University of California, Davis 95616. *Applicants for Assistant Professor should send graduate transcripts.* Position open until filled, but to guarantee consideration applications should be received by January 15, 1986; position available July 1, 1986. *The University of California is an equal opportunity, affirmative action employer, and invites applications from all qualified individuals.*

#428 DEPARTMENT HEAD VACANCY. Applications and nominations are invited for the position of Department Head, Accounting, College of Business Administration, one of five departments in the college, currently with twelve faculty. Undergraduate programs accredited by AACSB. Candidates must hold earned doctorate in an appropriate field, have teaching experience, and show record of scholarly achievement. Department Head must work effectively in a leadership role and be willing to undertake developmental activities. Appointment January 1986 or later. Salary and rank commensurate with qualifications. Send letter of application, resumé, official transcript of highest degree, and three letters of reference by November 1, 1985 to Office of Academic Affairs, Accounting Head Search, Western Kentucky University, Bowling Green, KY 42101. An Affirmative Action, Equal Opportunity Employer.

#429 THE UNIVERSITY OF NEVADA—RENO has tenure-track positions available beginning in the Fall of 1986. These positions are in the areas of auditing, managerial accounting, financial accounting, and computer information systems. Individuals must possess a doctorate degree in Accounting or Computer Information Systems or be in the dissertation stage of their doctorate programs. The Accounting & Computer Information Systems Department has 13 full-time faculty members. Excellence in teaching as well as research is stressed. The University of Nevada—Reno has approximately 9,500 full-time students at the Reno campus. Teaching opportunities are available to faculty members in both undergraduate and graduate courses. The rank and salary offered are subject to negotiation. If you are interested in any of our positions, contact Stephen A. Moscove, Chairman (telephone: 702-747-1050), or send resumé to the following address: Dr. Stephen A. Moscove, Chairman, Department of Accounting and Computer Information Systems, College of Business Administration, University of Nevada—Reno, 317E Business Building, Reno, Nevada 89557. The University of Nevada—Reno is an Affirmative Action/Equal Opportunity educator and employer and specifically invites and encourages applications from women and minorities. Closing date: November 15, 1985.

#430 THE UNIVERSITY OF NEBRASKA AT OMAHA invites applications and nominations for the William C. Hockett Alumni Accounting Professorship. Applicants should be eligible for appointment to a senior rank and capable of providing leadership in research and effective interaction with the professional community. An earned doctorate and a history of research and effective teaching are essential. Professional certification is desirable but not required. The closing date of the search is January 15, 1986. Nominations and applications should be sent to: Dr. David Buehlmann, Chairman, Professional Accounting, University of Nebraska at Omaha, Omaha, Nebraska 68182. An Equal Opportunity, Affirmative Action Employer.

#431 BUCKNELL UNIVERSITY invites applications for two tenure-track faculty positions in its accounting program. Our immediate needs are in audit/financial and in cost/managerial accounting but candidates with other interests will be considered. Ph.D. or D.B.A. strongly preferred. Candidates should be dedicated to teaching excellence and have an interest in research and professional activities. Rank commensurate with experience and academic background. Salary and fringe benefits are *very* competitive. Send resumé or inquiries to Dr. Charles Fazzi, Area Coordinator of Accounting, Bucknell University, Lewisburg, PA 17837, or call (717) 524-1315. Application deadline: November 30, 1985 or until positions are filled. An Affirmative Action/Equal Opportunity Employer.

#432 BOSTON UNIVERSITY'S SCHOOL OF MANAGEMENT is seeking applications for permanent appointments at all professorial levels in Accounting. Applicants should hold a doctoral degree or be at the dissertation stage. Candidates should have strong interests in both teaching and research. Candidates for advanced positions should also have a demonstrated record of achievement that is commensurate with the professorial level sought. Salary and benefits are competitive. Please send a resumé to Associate Dean John R. Russell, Boston University School of Management, 685 Commonwealth Avenue, Room 118, Boston, Massachusetts 02215. Boston University is an Equal Opportunity/Affirmative Action Employer.

#433 CHAIR POSITION. BOWLING GREEN STATE UNIVERSITY is seeking a chairman for the Department of Accounting and Management Information Systems starting in August 1986. Candidates should have a Ph.D. (or equivalent) and be qualified for appointment at either the rank of full or associate professor. The chair is expected to provide leadership to a 26-member department offering a full range of courses in both accounting and management information systems with 1,300 undergraduate majors, a Master of Accountancy program, and heavy demand for MBA courses within the MIS area. Candidates should have a proven track record in teaching, research, and service and have the ability to work with professionals in practice and industry. Salary is competitive and will depend on credentials and experience. Interested parties should submit a resumé and letter of application to Robert A. Patton, Dean, College of Business Administration, Bowling Green State University, Bowling Green, OH 43403 by February 1, 1986. Bowling Green is an Equal Opportunity/Affirmative Action Employer.

#434 WASHINGTON STATE UNIVERSITY has three Assistant Professor positions and one Associate or Professor position in accounting available beginning August 1986. Candidates at the Assistant Professor level must possess a doctorate, or be in the advanced stage of dissertation research (ABD), and have an interest in and the ability to conduct research leading to publication. Candidates at the Associate or Professor level must have a doctorate and have a demonstrated record in published research and effective teaching. Six-hour teaching load per semester, summer research support, and competitive salary and fringe benefits are available. Candidate review begins November 1, 1985. Send resumé to Glenn L. Johnson, Chairman, Department of Accounting & Business Law, Washington State University, Pullman, WA 99164-4850. AA/EOE.

#435 CANISIUS COLLEGE, Buffalo, New York, has openings for positions in financial and managerial accounting starting in the Fall of 1986. Applicants should possess a Ph.D. or D.B.A. with a concentration in accounting. ABDs and CPAs (or CMAs) at the advanced stage of their dissertation will be considered. Canisius College is a Jesuit institution with over 4,500 students. The graduate and undergraduate business programs are fully accredited by the AACSB. The Department of Accounting enjoys a very close relationship with the accounting community and is introducing a concentration in professional accounting at the MBA level. Applications should be addressed to Dr. Robert R. Davis, Chairman, Department of Accounting, Canisius College, Buffalo, New York 14208. AA/EOE.

#436 BOSTON COLLEGE is seeking applications for a permanent appointment at the Assistant or Associate Professor levels of Accounting. The applicant should hold a Ph.D. or D.B.A. degree, or be in the doctoral dissertation stage. The applicant should be qualified to teach in all areas of accounting both at the graduate and undergraduate level, but will be encouraged to pursue special areas of interest. There will be a particular need beginning in the Fall of 1986 for an individual with an interest in the taxation area. In addition to teaching responsibilities, the applicant will be expected to engage in scholarly research activities to complement his or her teaching assignments. The School of Management has an undergraduate and a graduate program, both accredited by the AACSB. Boston College is an Equal Opportunity/Affirmative Action Employer. Applicants should contact: Dr. Louis Corsini, Department of Accounting, Boston College School of Management, Chestnut Hill, MA 02167.

#437 YALE UNIVERSITY SCHOOL OF MANAGEMENT. The Yale School of Management is seeking to appoint assistant or non-tenured associate professors in the field of accounting. We are looking for outstanding scholar/teachers who have an interest in at least one discipline other than accounting. Ph.D. or equivalent in accounting, operations research, finance, economics, law, behavioral science, or politics is required. Rank and salary depend on qualifications. Applications are desired by December 15, 1985. Please send resumé, references, and an example of scholarly work to: Dean Burton G. Malkiel, Faculty Recruiting, Yale School of Management, Box 1A, New Haven, CT 06520. Yale is an equal opportunity, affirmative action employer.

#438 TAXATION POSITION WANTED for Fall 1986—four years teaching Tax and Business Law courses and four years Big Eight tax experience. Write for resumé.

#439 SOUTHWESTERN UNIVERSITY is seeking applications for an appointment at the Assistant or Associate Professor level of accounting. Applicants should hold the Ph.D. or DBA degree or be in the doctoral dissertation stage. Applicants should be qualified to teach a variety of undergraduate accounting courses. Southwestern is an undergraduate liberal arts institution related to the United Methodist Church. It is located on the outskirts of Austin, has an academically well prepared student body and a substantial endowment. Contact G. Benjamin Oliver, Dean, The Brown College of Arts and Sciences, Southwestern University, Georgetown, Texas 78626. An Equal Opportunity/Affirmative Action Employer.

#440 TULANE UNIVERSITY, A. B. Freeman School of Business is seeking a faculty member in accounting to fill a tenure-track position at the level of assistant professor. Salary and benefits are competitive. Please contact Dr. Soliman Y. Soliman, Accounting Group Coordinator, A. B. Freeman School, Tulane University, New Orleans, LA 70118, telephone: (504) 865-5401. An Equal Opportunity/Affirmative Action Employer.

#441 POSITION WANTED: Masters of Accounting, CPA, six years full-time experience teaching a variety of theory, financial, and managerial accounting courses at the undergraduate and graduate levels. Teaching awards have been received for two of the years. Desire a tenure-track position with productive, supportive environment in good family-oriented location. Prefer medium to small-size community. Available 1986–87 academic year.

#442 CALIFORNIA STATE UNIVERSITY, SACRAMENTO has accounting faculty openings, effective January/August 1986, in its accredited AACSB undergraduate and master programs. Salary and rank open, commensurate with academic preparation and professional experience. For tenure-track positions, applicants must hold an appropriate doctoral degree; professional experience and/or certification are recommended. Applicants in final stages of doctoral study may be considered for tenure-track positions with the requirement that the degree be completed during a specified time period. For temporary appointments, the applicants must have a master's degree, professional experience and/or certification, and must show evidence of intention to pursue the appropriate doctorate degree. Visiting appointments with doctoral degrees or with major preparation and professional accomplishments (one-year temporary employment) may be available as needed. Send application letter and resumé to Dr. Amin Elmallah, Chair, Department of Accountancy, School of Business and Public Administration, California State University, 6000 J Street, Sacramento, CA 95819-2694. Closing dates for applications are December 20, 1985, and July 31, 1986. CSU-Sacramento is an Equal Opportunity/Affirmative Action/Handicapped/Title IX/Vietnam Era Veteran Employer.

#443 CHAIRPERSON, DEPARTMENT OF ACCOUNTING. The Accounting Department of the University of South Alabama is seeking a chairperson. Ph.D. or DBA, record of research and outstanding teaching, and administrative skills required. Salary is competitive. The College is AACSB accredited at both undergraduate and MBA levels. Applications will be accepted through February 1, 1985, or until the position is filled. Contact: Jeanne Sylvestre, Accounting Department Search Committee, University of South Alabama, Mobile, AL 36688. The University of South Alabama is an affirmative action/equal opportunity employer.

#444 LEHIGH UNIVERSITY invites applicants for an Assistant Professor of Accounting—tenure-track position. Candidates must have a Ph.D., DBA, or be near completion and have teaching/research interests in one or more of the following fields within Accounting: Systems, Managerial, and Auditing. Appointment is expected to be effective in Fall 1986 or January 1987. Salaries are competitive and employee benefits are excellent. To be assured of consideration, send a current vita by December 1, 1985 to: Stuart K. Webster, Chairman, Department of Accounting, Lehigh University, Drown Hall #35, Bethlehem, PA 18015. The College of Business and Economics is AACSB accredited and the Department of Accounting has Type A Accounting Accreditation. Lehigh University is an Equal Opportunity, Affirmative Action Employer.

#445 JAMES MADISON UNIVERSITY School of Accounting has a position in taxation or systems available at the Assistant Professor level. Candidates should hold a doctorate or be ABD with demonstrated progress toward completion. Duties include those normally associated with academic teaching such as research and publication, committee work, and professional activities. JMU is state-supported and located in the beautiful, historic Shenandoah Valley of Virginia. Programs offered include the B.B.A. (Accounting), M.S.A. and M.B.A. The undergraduate and graduate accounting programs and the undergraduate and graduate business programs are all AACSB-accredited. Submit vita to: Dr. Lamont F. Steedle, School of Accounting, James Madison University, Harrisonburg, VA 22807. (703) 568-6607. AA/EOE.

#446 SAN FRANCISCO STATE UNIVERSITY has accounting faculty openings beginning Summer or Fall 1986 in our AACSB accredited undergraduate and master's programs. Salary and rank are open, commensurate with academic preparation and professional experience. For the tenure-track position, an appropriate doctoral degree or ABD status, professional experience and/or certification are required. A faculty member is expected to teach accounting undergraduate and graduate courses, to engage in instructional and professional activities, and research; major emphasis is teaching effectiveness. San Francisco State is an Equal Opportunity/Affirmative Action/Handicapped/Title IX Employer. Send application letter and resumé to Professor Steven M. Mintz, Department of Accounting and Finance, School of Business, San Francisco State University, 1600 Holloway Avenue, San Francisco, California 94132. Closing date for applications is February 15, 1986.

#447 CLEVELAND STATE UNIVERSITY seeks candidates for faculty position in Accounting. Rank dependent upon qualifications. Candidates for Assistant Professor should have Doctorate, or at least be in advanced dissertation stage. C.P.A., C.M.A., or C.I.A. and research capacity favorably considered. Candidates for Associate and Full Professor must have Doctorate and record of publication. Salary negotiable. Send resumé to: Dr. Elise G. Jancura, Chairperson, Department of Accounting and Business Law, Cleveland State University, 1983 E. 24th Street, Cleveland, Ohio 44115. (216) 687-4721. Equal opportunity employer m/f/h.

#448 THE UNIVERSITY OF WISCONSIN-MILWAUKEE is seeking an Assistant or Associate or Full Professor in Accounting for Fall 1986. All areas considered with particular needs in Auditing and Accounting Information Systems. Ph.D. must be completed; Associate or Full Professor positions require strong teaching and research record. Summer teaching and research support opportunities. Salary is competitive. Letter of application and resumé to Dr. Paul M. Fischer, P.O. Box 742, Milwaukee, WI 53201. An Affirmative Action/Equal Opportunity Employer.

#449 THE UNIVERSITY OF MINNESOTA'S DEPARTMENT OF ACCOUNTING invites applications for the position of Assistant Professor of Accounting (other ranks subject to funding). Applicants should possess a Ph.D. or should expect to obtain a Ph.D. before beginning employment. Responsibilities include conducting research, advising Ph.D. students, and teaching. Visiting positions will be considered. Applications should be received prior to February 15, 1986 for permanent positions and May 15, 1986 for visiting positions. The University of Minnesota is an equal opportunity educator and employer and specifically invites and encourages applications from women and minorities. John Dickhaut, Professor, Department of Accounting, University of Minnesota, 271 19th Avenue South, Minneapolis, MN 55455. (612) 373-5630.

#450 POSITION WANTED: M.COM. (University of Bombay), B.G.L. (University of Bombay), A.C.A. (India), A.I.C.W.A. (India), nearly completed M.B.A. (Saint Mary's University), with over six years experience in accounting and finance. Interested in teaching though without formal teaching experience. Seeks full-time (not necessarily tenured) teaching position in Financial Accounting, or Managerial Accounting or Business Finance. Any location in U.S.A./Canada/Australia. Write or call collect: R. J. Iyengar, 6066 South Street, Apt. 1A, Halifax, Nova Scotia, Canada B3H 1T1; (902) 422-4203.

#451 ACCOUNTING FACULTY POSITION—West Chester University is seeking a faculty member in Accounting to fill a tenure-track position for January 1986 or September 1986. Duties include teaching at undergraduate and graduate levels, student advising, program development and professional development. Ph.D./DBA with professional work experience in accounting and teaching experience preferred; ABD or Master's degree with CPA/CMA will be considered. Rank and salary are commensurate with qualifications. Send resumé and letter of application postmarked by October 1, 1985 to: Dr. Richard L. Baker, Department of Accounting, West Chester University, West Chester, PA 19383. West Chester University is an Equal Opportunity/Affirmative Action Employer. Women and minorities are encouraged to apply.

#452 SIMON FRASER UNIVERSITY invites applications for tenure-track appointments in Accounting and/or Management Science/M.I.S. Rank open. Successful candidates must have strong research and teaching abilities for both undergraduate and graduate courses. Ph.D. in hand or near completion. Be prepared to actively participate in the development of the Faculty. Start date—September 1986 (flexible). Candidates eligible for employment in Canada at time of application are preferred. All positions are subject to budgetary approval. Send curriculum vitae and names of three references to: Appointments Committee, Faculty of Business Administration, Simon Fraser University, Burnaby, B.C., Canada, V5A 1S6.

#453 RIDER COLLEGE invites applications for positions in accounting starting in September 1986. Teaching and research are emphasized for promotion and tenure. Preference is given to persons possessing appropriate doctoral degree or ABD. Rider College offers an MBA program and undergraduate degree programs in accounting and nine other areas. The Accounting Department currently has 14 full-time faculty and 600 majors. Rider College is located five miles south of Princeton in an attractive residential area. Please send vita to Dr. Marianne Battista, Accounting Department, Rider College, 2083 Lawrenceville Road, Lawrenceville, NJ 08648-3099. Rider College is an equal opportunity/affirmative action employer.

#454 FACULTY POSITION-CARNEGIE-MELLON UNIVERSITY is searching for Assistant Professors to teach accounting in graduate and undergraduate programs. Individuals should have the potential for excellence in research, and training in the disciplines of economics, finance, mathematics and statistics. Applicants should submit a current vitae and evidence of research such as publications, working papers, or dissertation proposal and chapters to: Professor Stanley Baiman, Graduate School of Industrial Administration, Carnegie-Mellon University, Pittsburgh, PA 15213. Carnegie-Mellon University is an equal opportunity/affirmative action employer.

#455 CHAIRPERSON, GEORGE MASON UNIVERSITY. The Department of Accounting and Business Legal Studies invites nominations and applications for the departmental chairperson effective September 1, 1986. Candidates should possess a doctorate, preferably with accounting as a major area of study. Applicants should have established credentials sufficient to support a senior level faculty appointment with tenure. Salary for the appointment is very competitive. George Mason University, the State University of Northern Virginia, is located approximately 20 miles west of Washington, DC. The University is a dynamic, growing institution with 16,000 students. The School of Business Administration has over 3,400 undergraduate students of which over 400 are accounting majors. Graduate offerings include an established MBA program and a new M.S. in Accounting program. The Search Committee will begin considering candidates after December 1, 1985. Inquiries, nominations or applications should be sent to: Dr. Ben Sands, Chairman, Search Committee, School of Business Administration, George Mason University, 4400 University Drive, Fairfax, VA 22030. George Mason University is an AA/EOE employer.

#456 WEST GEORGIA COLLEGE has two positions in the Department of Accounting and Finance available Fall 1986. Ph.D. preferred, but will consider ABD near completion. Primary teaching areas include financial accounting and accounting information systems. Salary competitive. Recent doctorates may be eligible for the *Warren P. and Ava F. Sewell Chair of Private Enterprise*, a rotating chair focused on teaching excellence. The chair provides an annual salary supplement and other financial support. Send resumé to: Paul D. Baker, Department of Accounting and Finance, West Georgia College, Carrollton, GA 30118. WGC is an AA/EO employer.

#457 UNIVERSITY OF NORTHERN COLORADO has tenure-track and temporary positions in Accounting. Applicants should have appropriate terminal or Master's degree. Preference will be given for the following backgrounds: certification, computer proficiency, teaching experience and/or accounting work experience. Application deadline: November 15, 1986. Send letter of application, resumé, and name, address and telephone numbers of three references to: Dr. William L. Duff, Dean, College of Business Administration, University of Northern Colorado, Greeley, CO 80639. UNC is an Affirmative Action/Equal Opportunity Employer and specifically invites applications from women and minorities.

#458 FLORIDA ATLANTIC UNIVERSITY, School of Accounting, has several tenure-track positions available for Fall 1986. Ph.D. or DBA with a concentration in Accounting is required. Prefer applications for Assistant or Associate with teaching interests in tax or systems. Research and publication record should be commensurate with position. Teaching excellence, research, and professional activity are expected. The College of Business and Public Administration is AACSB accredited. FAU is an Equal Opportunity/Affirmative Action Employer and applications from minorities and women are encouraged. Please send vita to: Dr. Carl Dennler, Jr., Director, School of Accounting, Florida Atlantic University, Boca Raton, Florida 33431.

#459 CHAIRPERSON: The Pennsylvania State University is seeking a Chairperson for its Department of Accounting and Management Information Systems to begin July 1, 1986. The responsibilities are to: Enhance external relations with business and governmental communities; maintain internal relations with other academic units in the university; support active and diversified research programs of the department's faculty; and continually refine curriculum offerings for Ph.D., Master's, and baccalaureate degree programs. Candidates should possess a record that demonstrates a commitment to research and higher education and a strong desire to continue to build the Department and College's reputation of national prominence. A doctorate and/or significant experience at a senior executive level in business are essential. Applications should be received by November 14, 1985 or until position is filled. Send resumé and references to Dr. Mark W. Dirsmith, Chairman, Search Committee, Business Administration Building, University Park, PA 16802.

#460 UNIVERSITY OF MASSACHUSETTS/BOSTON seeks qualified candidates in Accounting, all ranks. Ph.D./DBA in Accounting required; candidates nearing completion of the doctorate will be considered. Competitive salary and benefits. Applications received by *12/1/85* will be given priority. Send vitae and cover letter to Dr. Lal Chugh, Chair, Department of Accounting/Finance, College of Management, University of Massachusetts, Harbor Campus, Boston, MA 02125. An equal opportunity, affirmative action, Title IX employer.

#461 LOYOLA COLLEGE IN MARYLAND has tenure-track accounting positions in managerial, international, financial and tax at all ranks for January and September 1986. The College is actively pursuing AACSB accreditation. Faculty teach in undergraduate, Master of Professional Accountancy, MBA, and Executive MBA programs. There is an eight-person department and 90 senior accounting majors. Freshman SATs average 1072. Two-course teaching load with research and publications required and supported. Applicants must possess doctorate or equivalent; however, candidates nearing completion of dissertation will be considered. Reply to: John P. Guercio, Chairman, Department of Accounting, Loyola College, 4501 N. Charles Street, Baltimore, MD 21210. EEO/AAE.

#462 BOWLING GREEN STATE UNIVERSITY is seeking applicants for tenure-track positions (associate or assistant) and term instructorships in accounting or management information systems, starting January 1986 or August 1986. Requirements for the tenure-track positions are a Ph.D. or equivalent (or an advanced-stage ABD at the assistant level) and a commitment to research and teaching. Applicants for instructor should hold an appropriate master's degree. The CPA, CMA, or CIA certificate is desirable for accounting applicants. The University, a state-supported institution with an enrollment of 16,000, is located 25 miles south of Toledo. Applications and inquiries should be directed to Professor Park E. Leathers, Acting Chair, Department of Accounting and Management Information Systems, Bowling Green State University, Bowling Green, OH 43403. Bowling Green is an Equal Opportunity/Affirmative Action Employer.

#463 THE UNIVERSITY OF SAN DIEGO, School of Business, is seeking applications for tenure-track appointments at the Assistant or Associate Professor levels. All teaching areas are available in the undergraduate and MBA programs with special needs in (1) tax and (2) managerial. A Masters program in Taxation was recently approved. The university numbers 5,000 students and the School of Business is AACSB accredited. Ph.D. or DBA required. ABD also considered. If you think that a small, quality-oriented school where your input counts is where you would like to be, we would like to talk with you. Please contact Tim Kelley, School of Business, University of San Diego, CA 92110. (619) 260-4846.

#464 DIRECTOR. THE UNIVERSITY OF SOUTHERN MISSISSIPPI invites applications for the position of the Director of the School of Professional Accountancy beginning July 1, 1986. Candidates should have a Ph.D. or a D.B.A., a record demonstrating a commitment to scholarly research, publication, service, teaching, and the ability to interact with professionals in the business community. The School of Professional Accountancy currently has 15 full-time faculty, 560 undergraduate majors, and offers degrees at the bachelor and master levels, the "A" program having been accredited since 1982. Interested parties should submit a resumé, a letter of application, and the names, addresses, and telephone numbers of three references by December 1, 1985, to Paul D. Torres, Chair, Search Committee, Box 5178, Southern Station, Hattiesburg, Mississippi 39406-5178. Equal Opportunity/Affirmative Action Employer.

#465 THE DEPARTMENT OF ACCOUNTING, KENNESAW COLLEGE, has tenure-track faculty vacancies at the Assistant or Associate levels. Kennesaw College is a rapidly growing senior college in the University System of Georgia, located in the Greater Metropolitan Atlanta area. Ph.D. or D.B.A. preferred, CPA required. Please send letter of interest, resumé, and list of three references to Dr. Ralph W. Frey, Chairman, Department of Accounting, Kennesaw College, P.O. Box 444, Marietta, GA 30061. Closing date is January 31, 1986.

#466 ACADEMIC PROGRAM ADMINISTRATOR. Accounting faculty of seven positions in addition to administrator. Historically strong undergraduate teaching orientation is encouraging development in scholarship. Present faculty have greatest depth in taxation, financial and managerial areas and least depth in auditing and systems. Candidates should possess doctorate in accounting, CPA strongly preferred, teaching and research record to support appointment at associate or full professor rank. Application deadline November 1, 1985 or until suitable candidate identified. Appointment effective July 1–August 1, 1986. Apply to: Dean Richard E. Olson, School of Business, Washburn University, Topeka, KS 66621. Washburn is an equal opportunity/affirmative action employer.

#467 NORTHWESTERN UNIVERSITY, Evanston, Illinois, invites applications for one or more tenure-track openings in accounting at the assistant professor level available for September 1986 in the J. L. Kellogg Graduate School of Management. Salary competitive. Candidate selection criteria include superior teaching capability, outstanding potential for rigorous research, and excellent recommendations. We offer Master of Management and Ph.D. programs. Ph.D. (or close to completion) is required. Send resumé, transcripts, and dissertation proposal to: Professor Robert P. Magee, Recruiting Coordinator, Department of Accounting and Information Systems, J. L. Kellogg Graduate School of Management, Northwestern University, Evanston, Illinois 60201. An Equal Opportunity Employer.

#468 UNIVERSITY OF LOUISVILLE. Appointments as Assistant/Associate Professor of Accounting are available in the School of Business. Minimum qualifications for Assistant are: A Ph.D. or DBA, demonstrated potential for teaching effectiveness, and demonstrated potential for quality research capabilities. ABD's will be considered. Minimum qualifications for Associate are: A Ph.D. or DBA, demonstrated teaching effectiveness, and demonstrated quality research capabilities. Beyond minimal qualifications, preference will be given for possession of CPA or CMA. For the tax area the LLM is considered a terminal degree. If you wish to take advantage of this opportunity, send your vita to: Dr. Alan Attaway, Chairman, Department of Accounting and Commercial Law, School of Business, University of Louisville, Louisville, Kentucky 40292. An Equal Opportunity/Affirmative Action Employer. Vitae will be considered in three groups or until the positions are filled. First group received by September 15, 1985; second group received by November 15, 1985; third group by January 15, 1986.

#469 SUFFOLK UNIVERSITY, Boston, Massachusetts. The School of Management's Accounting Department anticipates tenure-track openings at the assistant/associate professor levels to teach undergraduate/graduate courses in managerial and/or financial accounting. Ph.D. or DBA required. ABDs in final stage considered. Professional certifications desirable. Apply to: Ronald Sundberg, Associate Dean, School of Management, Suffolk University, 8 Ashburton Place, Beacon Hill, Boston, MA 02108 or call (617) 723-4700, ext. 307. An equal opportunity, affirmative action employer.

#470 THE UNIVERSITY OF DAYTON invites applications for tenure-track positions in accounting at the Assistant/Associate Professor rank for fall 1986. A Ph.D./DBA or ABD very near completion is required; appropriate professional certification is desirable. Responsibilities include teaching at the undergraduate and graduate level, research at a level appropriate for an AACSB accredited program, service, and professional activities. Qualified candidates should send letters of application and resumés to: Ron Burrows, Chairperson, Department of Accounting, University of Dayton, 300 College Park, Dayton, OH 45469. The University of Dayton is an Affirmative Action/Equal Employment Opportunity Employer.

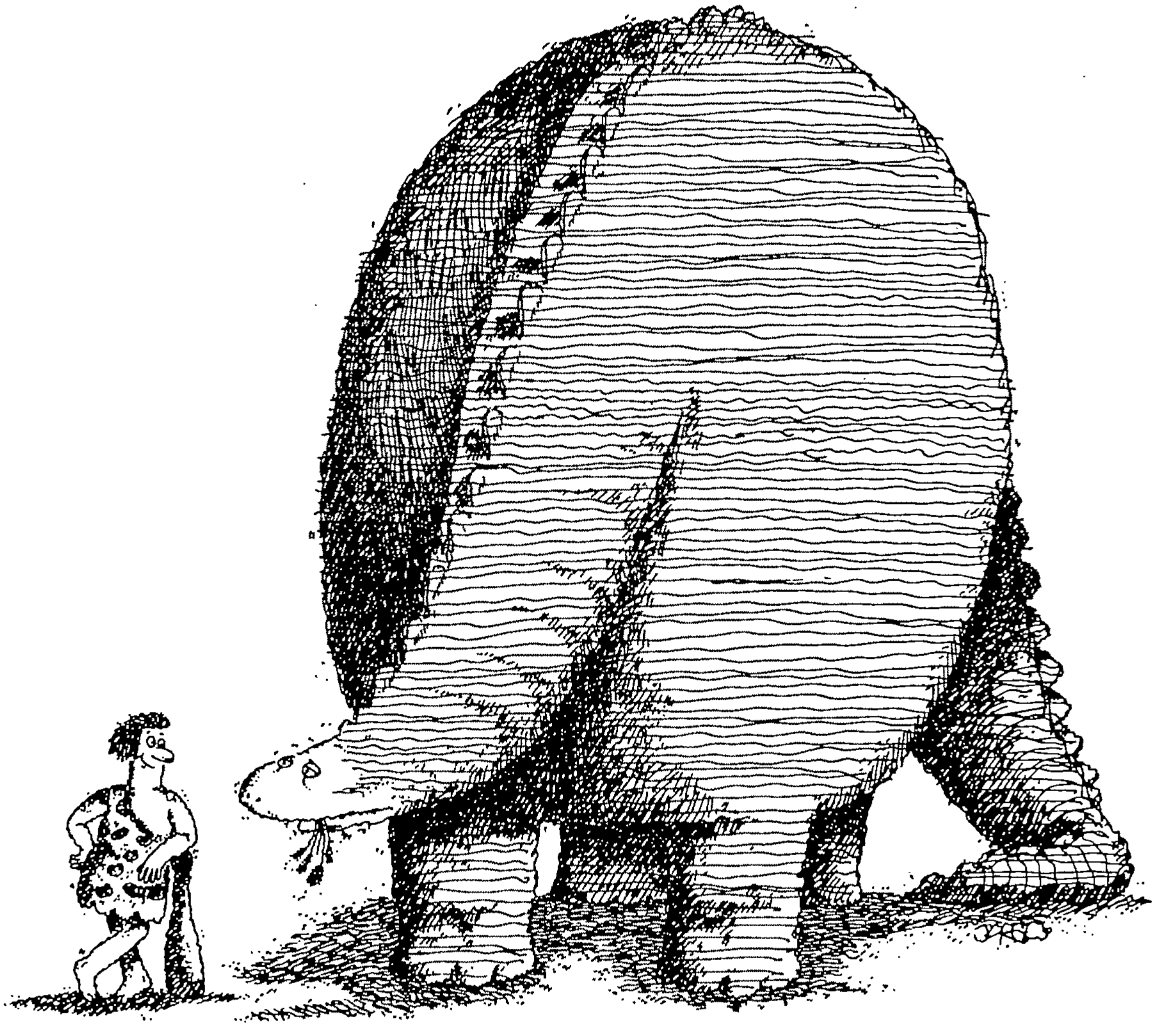
#471 AVAILABLE SPRING OR FALL 1986. Ph.D. in accounting with many years of graduate and undergraduate teaching experience, seeks full-time visiting teaching appointment at institutions in attractive locations.

#472 THE UNIVERSITY OF UTAH is seeking applications for the position of Assistant Professor of Accounting. Applicants should hold doctorate or be ABD in final dissertation stages. In addition to teaching responsibilities, all applicants are expected to perform scholarly research. Salaries are competitive and fringe benefits are excellent. Bachelor's, MPA, MBA, and Ph.D. programs are offered. Application deadline December 15, 1985, or until position is filled. Send resumé to Dr. Barry E. Cushing, Graduate School of Business, University of Utah, Salt Lake City, Utah 84112. An equal opportunity/affirmative action employer.

#473 THE DEPARTMENT OF ACCOUNTING AT THE UNIVERSITY OF IDAHO invites applications for two (2) tenure-track faculty positions for an assistant or associate professor of Accounting in the areas of auditing, financial, managerial, or information systems. Ph.D. or DBA in accounting is required. Applicants with a commitment to teaching, research and service are preferred. CPA, CIA and/or CMA desirable. ABDs will be considered. Qualified candidates should send a letter of application and resumé to: Jeff Harkins, Department of Accounting, University of Idaho, Moscow, ID 83843 or call (208) 885-6453. Review of applicants' credentials will begin on October 1, 1985 and application materials received after that date may not be considered. The University of Idaho is an EO/AA employer.

#474 MOORHEAD STATE UNIVERSITY Department of Accounting has three tenure-track positions effective Fall 1986 teaching in an undergraduate program with more than 500 majors. Opportunities for graduate-level teaching, summer teaching, and consulting. Qualifications for Associate Professor: Earned doctorate with specialization in accounting, or ABD actively working on dissertation. Qualifications for Professor: Earned doctorate with a specialization in accounting and established teaching and research record. Professional certification desirable. Business and teaching experience preferred. Write to Search Committee Chair, Accounting Department, Moorhead State University, Moorhead, Minnesota 56560. Application deadline December 1, 1985 or until filled. Equal opportunity/affirmative action employer.

#475 THE STATE UNIVERSITY OF NEW YORK AT BUFFALO has a September 1986 opening for an Assistant or Associate Professor of Accounting. Fields of interest may include financial accounting, managerial accounting, auditing, and accounting information systems with teaching opportunities at undergraduate, M.B.A., and Ph.D. levels. Teaching load is six hours per semester. Candidates for an Assistant Professor position should have a strong interest in research and possess relevant research tools and have an earned doctorate or be in the advanced stage of dissertation research by September 1986. Candidates for an Associate Professor position should have a completed doctorate, an established research record, demonstrated teaching ability, and an ability to supervise doctoral students and work with junior faculty. Salary and fringe benefits are competitive. The University is an Affirmative Action/Equal Opportunity Employer. Please send resumé to Professor John C. Gardner, 344 Jacobs Management Center, State University of New York at Buffalo, Buffalo, New York 14260.



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P.O. Box 830688
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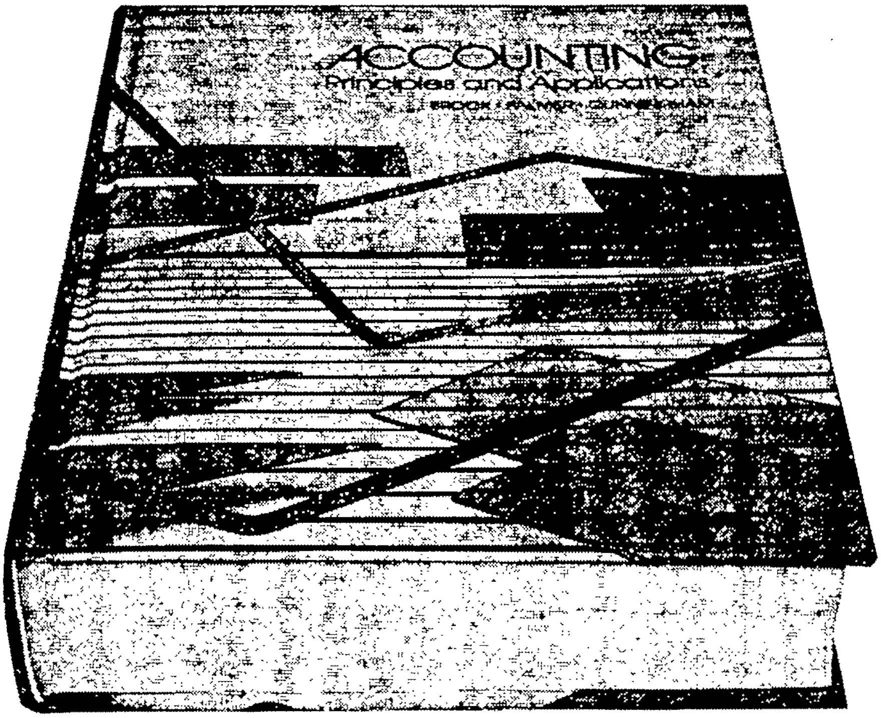

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